

RAILROAD GAZETTE

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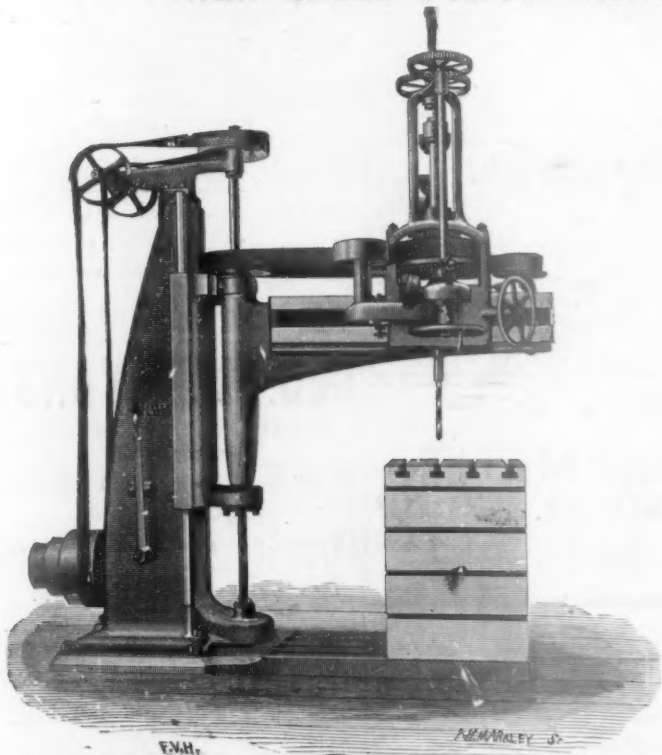
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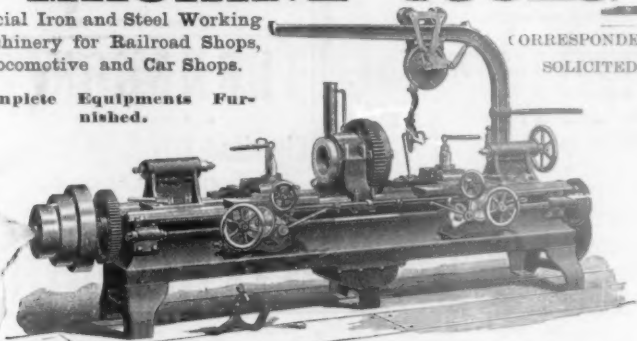
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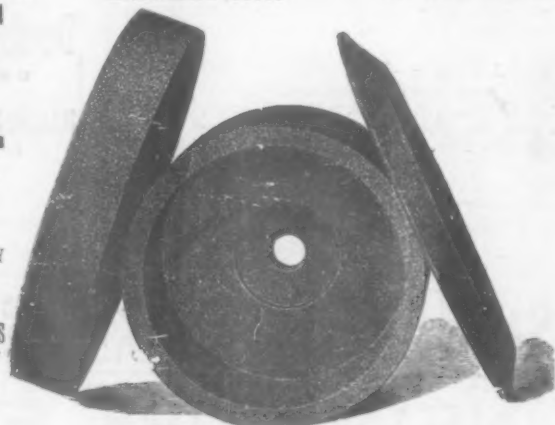
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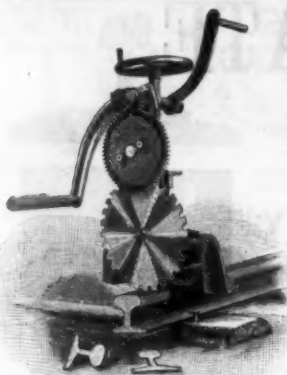
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Standard Paint Co., 2 Liberty St., N.Y.
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Cambria Iron Co., Johnstown, Pa.
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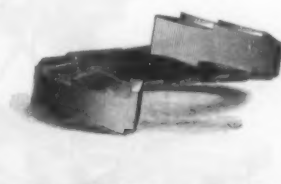
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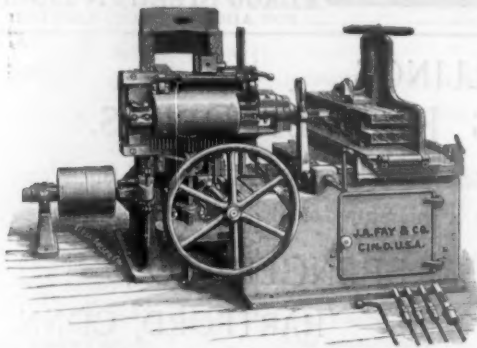
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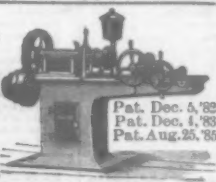
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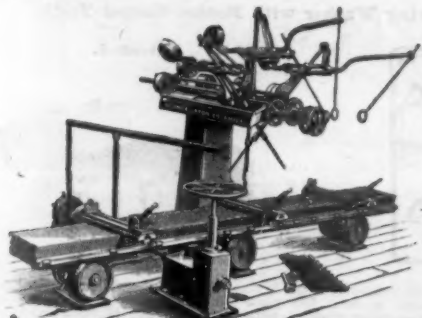
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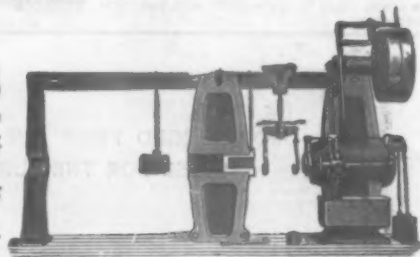
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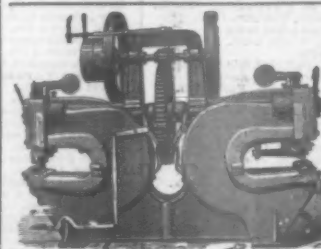
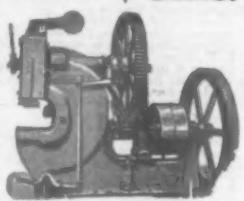


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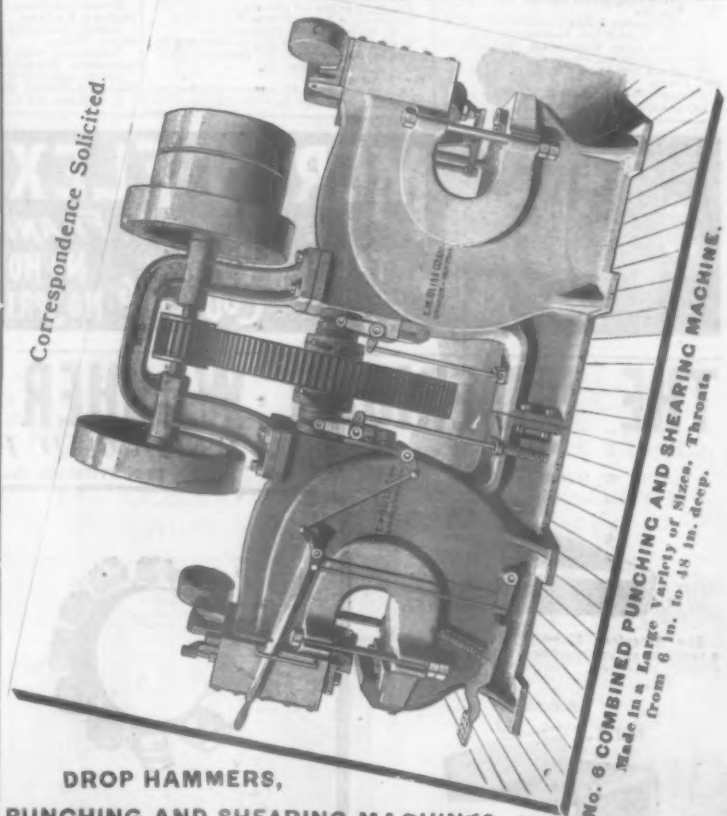
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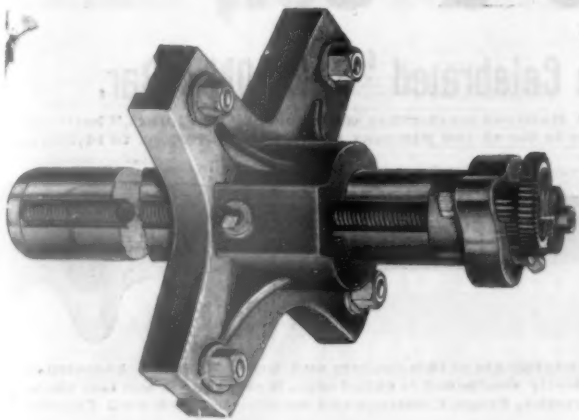
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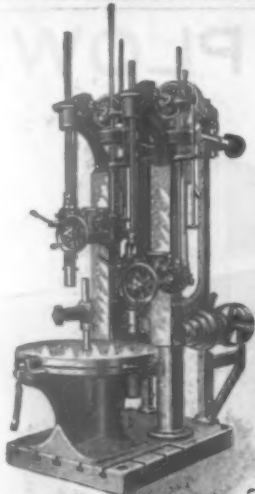
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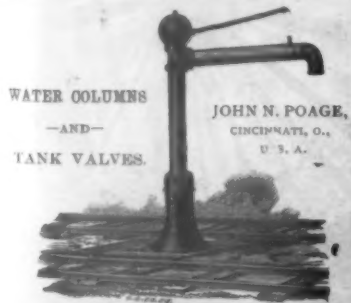
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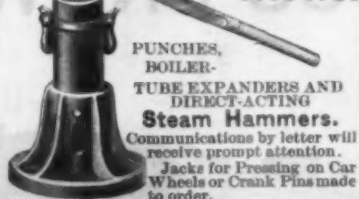


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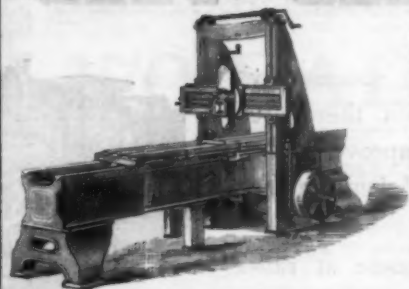
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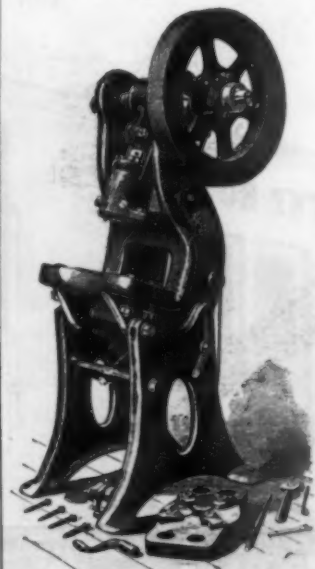


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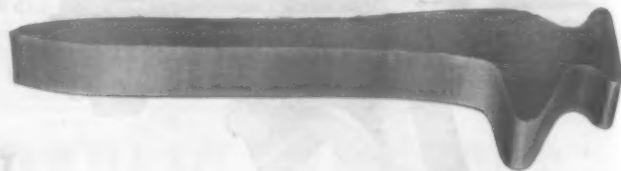
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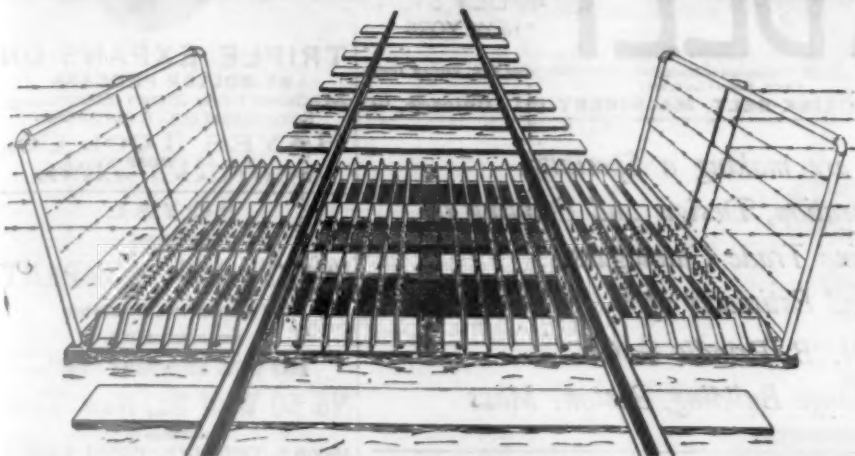
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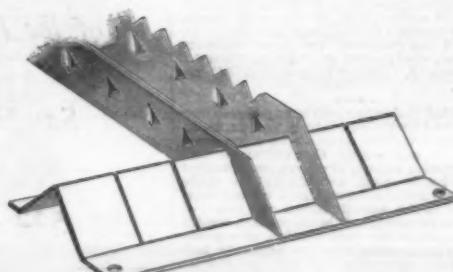
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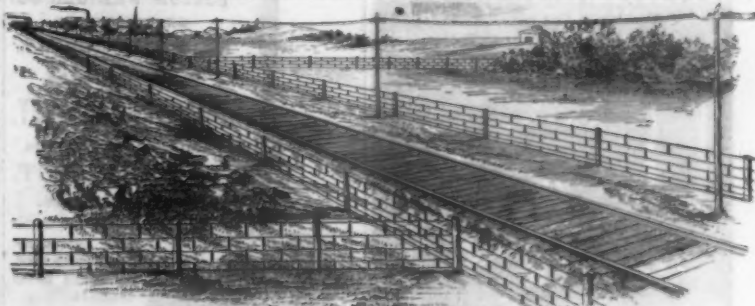
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THE SANITARY DISTRICT OF CHICAGO. TO CONTRACTORS.

Sealed proposals addressed to the Board of Trustees of the Sanitary District of Chicago and endorsed:

PROPOSALS FOR EXCAVATING THE MAIN DRAINAGE CHANNEL will be received by the clerk of the said Sanitary District at Room H Rialto Building, Chicago, Ill., until 12 m. (standard time) of Wednesday, the 8th day of June, 1892, and will be publicly opened by the said Board of Trustees at the regular meeting held that day, or at a special meeting called for that purpose.

The work for which the said tenders are invited is the excavation of the main drainage channel for the said Sanitary District between Willow Springs and Joliet, Ill., and consists in all of about 11,500,000 cubic yards of rock, of about 5,000,000 cubic yards of earth, the building of 287,241 cubic yards of dry rubble walls, and 244,444 square yards of slope paving.

Bids will be received on three different propositions, designated as "Proposition 1," "Proposition 2," and "Proposition 3," respectively.

As provided under the different propositions said work will be divided into 14 to 17 sections, each of which will be treated as a separate contract in canvassing the proposals and making awards, except as otherwise provided in Proposition 3. As all awards will be made by individual sections or a group of sections, as provided in the specifications and forms of proposals to be furnished bidders, each bidder must make prices for each section, or a group of sections, as the case may be, separate and distinct from every other. The jumping of prices in any bid other than as given in the form of proposal under Proposition 3 will render such bid informal and will cause its rejection by the said Board of Trustees.

As the question of which proposition will be acted upon will not be determined by the Board of Trustees until after the time set for receiving proposals the bidder is allowed to make three alternative tenders based upon the terms of the specification for each of the three propositions respectively.

Each proposal must be accompanied by a certified check or cash to an amount equal to \$3,000 multiplied by the number of sections bid upon, whether said sections stand singly or in a group. Provided, that the said check or cash shall entitle the bidder to make tender under any or all three of the said propositions.

All certified checks must be drawn on some responsible bank doing business in the city of Chicago and be made payable to the order of the Clerk of the Sanitary District of Chicago. Said amount of \$3,000 for each section will be held by the Sanitary District until all of said proposals have been canvassed and contracts awarded and signed, the return of said check or cash being conditioned upon any bidder to whom an award of any portion of said work may be made appearing within 10 days after notice of such award being given, with bondsmen, and executing a contract with the Sanitary District for the section or sections of said work so awarded, and giving a bond satisfactory to the said Board of Trustees for the fulfillment of the same in the amount of \$100,000 for each section of work awarded him, whether said sections be awarded singly or in a group.

All proposals must be made on blank forms furnished by the Sanitary District and must give the price for each separate item of work. A form will be furnished for each of the three propositions.

The bids will be compared on the basis of the engineer's approximate estimate of quantities, which will be furnished with copies of the specifications.

No proposal will be considered unless the party making it shall furnish evidence satisfactory to the Board of Trustees of his ability to do the work, and that he has the necessary pecuniary resources to fulfill the conditions of the contract, provided such contract shall be awarded him.

Bidders are required to state in their proposals their individual names and places of residence in full.

Specifications may be had and plans may be seen at the office of the Chief Engineer, Room E Rialto Building, Chicago, Ill.

The said Board of Trustees reserve the right to reject any and all bids.

THE SANITARY DISTRICT OF CHICAGO,
By FRANK WENTER,
President of its Board of Trustees.

Attest:
THOMAS F. JUDGE, Clerk.
Chicago, Ill., April 7, 1892.

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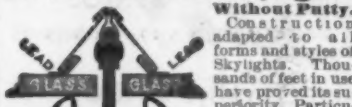
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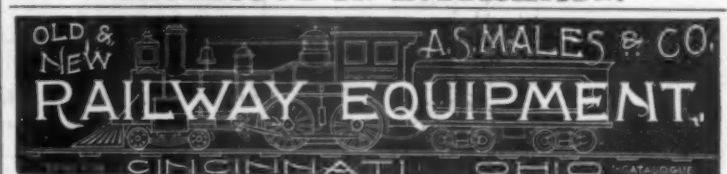
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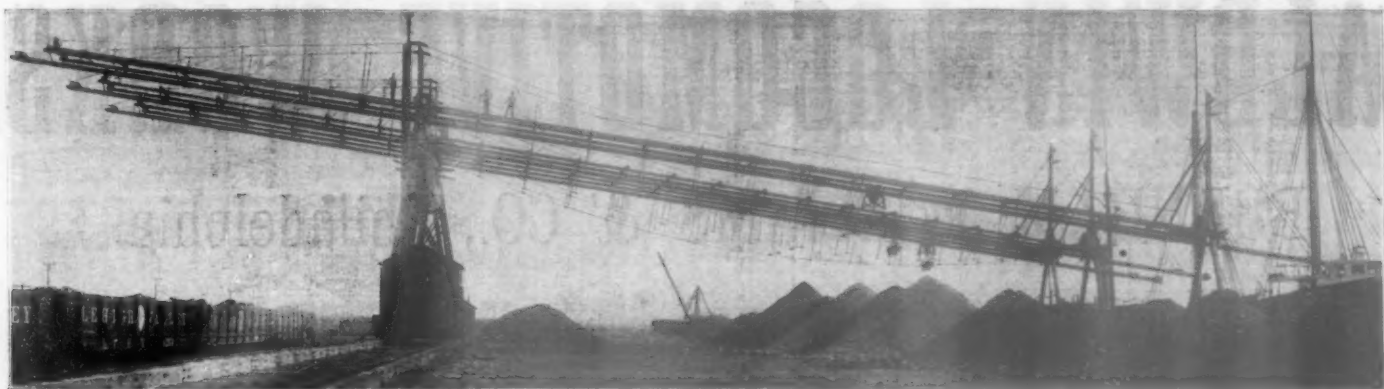
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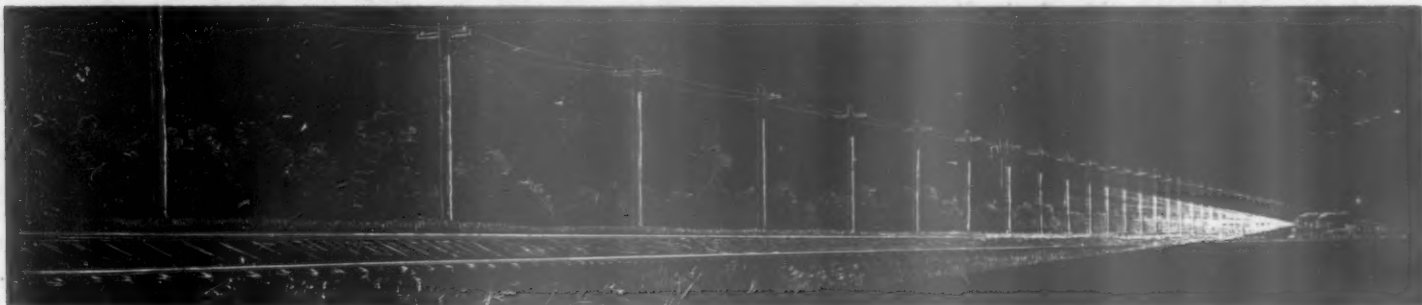
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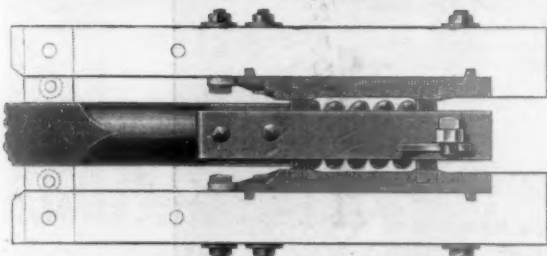
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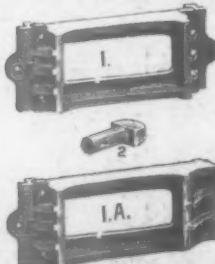
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T. B. STAPLER, Secy. and Treas.

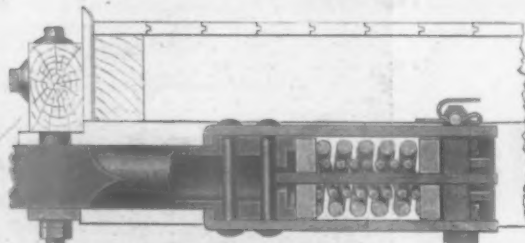
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Plan View No. 1.



Perspective.



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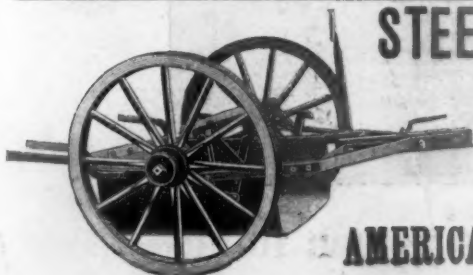
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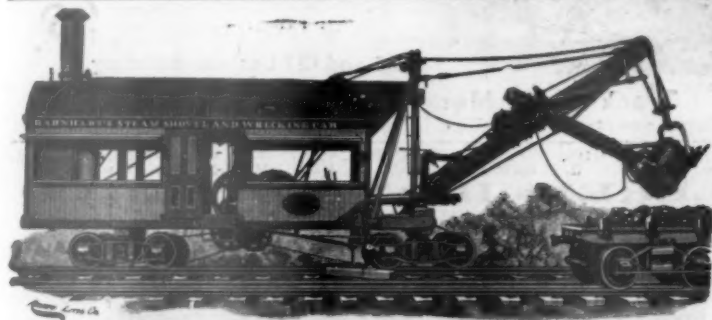
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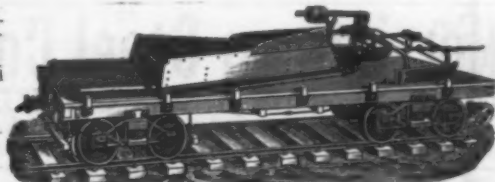
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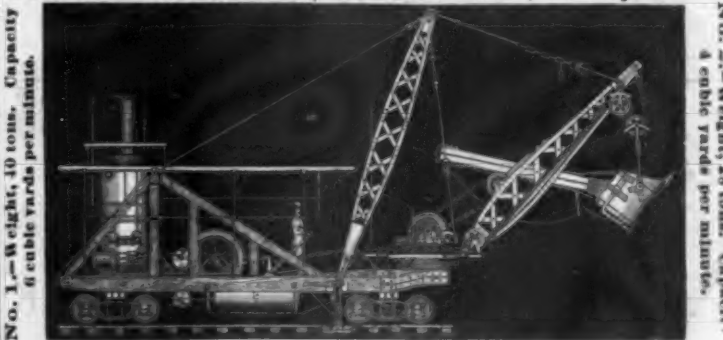
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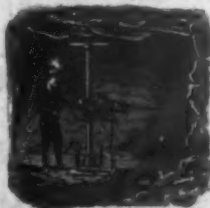
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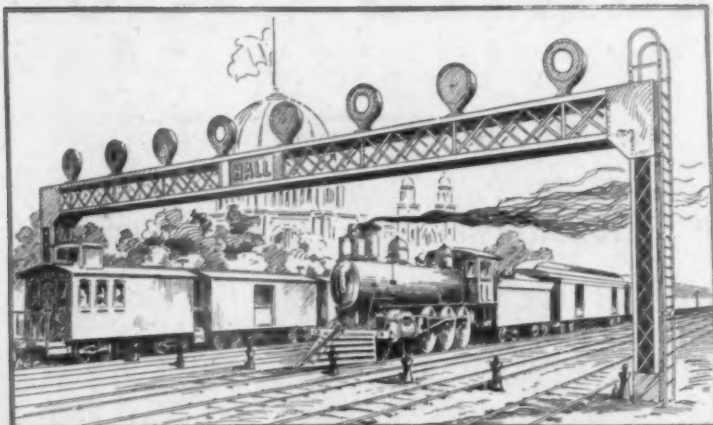
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THE KINSMAN BLOCK SYSTEM COMPANY,

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[Definite Announcements will be made in this space in succeeding issues.]

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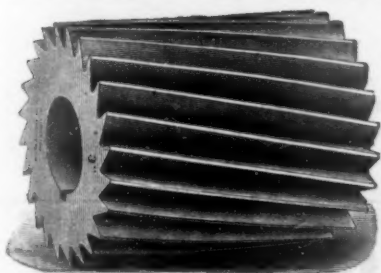
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Centrifugal Force and the Flywheel.

TO THE EDITOR OF THE RAILROAD GAZETTE:
In my article on page 201 of the *Railroad Gazette* for April 22, I find a slip in the type made after proof reading. At the top of centre column I find

$$C = \frac{.26 \times 27201.9}{32.16 \times 7} = \frac{7072.49}{225.12} 1.41 \text{ l} = 3 \text{ be.}''$$

It should read

$$C = \frac{.25 \times 193600}{32.16 \times 7} = 223.15 \text{ lbs.}$$

WM. H. WEIGHTMAN.

Freight Car Framing.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I lately saw the box cars building as standard by the Georgia Railroad, and was struck by several admirable features, and will mention one. The trussing is deep and adequate, and the car is built with scarcely any camber. My experience as a bridge engineer has always led me to look with disfavor on the customary method of building cars. It was formerly thought, in bridge construction, to be a good thing to have an emergency apparatus. One system of trussing took the load until the structure settled upon a second system. The old McCallum truss is an illustration. Latterly we found out that under different conditions one system or the other must take all the burden—hence each must be equal to the full load, and thus two adequate bridges were needed where either one would do. Nowadays we build one bridge, and build it strong enough, and put the other somewhere else. So in car building a car has a lot of framing to support the load, and then they truss it underneath to support the load also. A considerable camber is given the car due to the framing. By the time it is settled down the roof is all buckled up—not being a heavy girder or compression piece—and so after a series of bucklings and tensions the roof leaks and the sheathing of the car is loosened, the door rigging gets loose, and things begin to have the wavy.

I believe that the trussing should be ample and deep; that a camber, reckoned as bridge cambers are, perhaps $\frac{1}{4}$ in., is all sufficient, and that the framing should be solely with a view to withstanding the pressure of lading in bulk and holding itself together like a house. It seems to me that thus the cost of cars would be reduced, the dead weight would be reduced, and the durability of the car much enhanced. The present construction seems to be a strange mixture of attempts to make a car body rigid by framing, and at the same time make the framing light enough so that the car shall be sufficiently flexible to settle an inch and a half or so in the centre.

If I were a car builder, I would make a break at building a rigidly supported car body, so that its greatest load would not strain a joint but rest upon substantial trusses.

ENGINEER.

Locomotive Comparisons.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wish to protest against the method of comparing engines that has been used during the past year by those engaged in the English and American locomotive controversy. Any possible system of averaging results of performance is not only misleading but it is absolutely false. Averages are only safe to rely upon when the minimum and the maximum amounts do not vary much from the mean. Locomotive performance sheets are still believed by some to have a definite value, and so they do have in many cases upon a given road under

fixed conditions; but I believe the majority of careful observers regard them as one of the most uncertain and unsatisfactory kinds of record, when obtained from different roads or different divisions, that is ever placed before a mechanical officer. It is not uncommon for the higher officers to call for explanations from the mechanical department as to the reasons why the fuel used per ton mile is less or more on different divisions, as shown by the performance sheets. This is a perplexing and generally a useless question. The fact is, that, in general, the conundrum cannot be answered; the conditions are too much involved. An examination of performance sheets on the same road shows little harmony in results even where the conditions are like, and no one knows how to make the proper allowances when there is a difference in conditions. From such records there often appears a difference in economy of action on two different roads that is ridiculously large, and which would lead to fallacious decisions regarding the relative values of different locomotives, if such recorded performances were taken as indicating those values.

Scientific tests are of more value than monthly records of performance in determining the comparative value of different designs of locomotives on different roads, though their value is extremely limited owing chiefly to the lack of accurate data regarding ruling conditions. The most careful road tests almost always fail to take into account all of the important differences in the actual work done and in the existing conditions. Tests with the dynamometer car do show quite accurately the comparative results of operating different locomotives under *different conditions*, but they give little clew to the comparative value of different locomotives under the same conditions, and this is the information usually sought. To deduce a safe comparison of designs from a comparison of tests on different roads by different men there must be a standard method of making tests, and such standard must include more data than are generally collected.

Let me illustrate. A material difference in any of the following details of performance and conditions, unless accounted for, will render comparisons of locomotive tests under different conditions wholly impracticable: Heat value of fuel; mechanical properties of fuel, such as coking and fusing; method of firing; scale on heating surfaces of boiler; number of stops and abrupt changes in speed made by application of the brakes; weight of train in proportion to the ruling dimensions of the engine; force and direction of the wind, particularly if a side wind; general alignment of the track, its condition and the grade. In addition to this essential data it is necessary that all the results should be based on the same unit and expressed in the same way.

Of course, to obtain such information entails a stupendous amount of labor, and mechanical engineers have lately been looking about for some means of accurate comparison better than can be obtained from actual running. The shop test is now up for consideration, and the committee appointed by the American Society of Mechanical Engineers to report upon a standard method of testing locomotives is seriously considering the value of a test of an engine when "jacked up" in the shop. So far as a test of the relative efficiencies of the boilers and the cylinders go, a shop test can be made more accurate than it is possible to make a test on the road. Probably the first shop tests will not be satisfactorily comparable, but after some experience we may expect a satisfactory development of a standard locomotive shop test; perhaps to be supplemented by a road test so as to include some conditions which it is not possible to produce in a shop. A controversy about the relative merits of English and American locomotives is begun at intervals of about two years, and so far the results of these controversies have proved absolutely nothing. It is probable that when the two types of engines are loaded with their most economical load and operated under the same conditions with the same fuel, there will be scarcely any difference in the fuel used per ton mile. The whole controversy is but the result of a comparison of incomparable records.

JUSTICE.

Government Statistics of Couplers and Brakes.

Below is a copy of the bill introduced in the Senate last week by Mr. Cullom, from the Committee on Interstate Commerce, directing the Interstate Commerce Commission to report annually to Congress the number of automatic couplers and air brakes in use on freight cars.

Be it enacted, etc.: That the Interstate Commerce Commission be, and it is hereby, authorized and directed to ascertain and report to Congress on or before the first Monday in December in each year, the total number of freight cars owned, leased or operated by common carriers engaged in interstate commerce on the 30th day of June of such year: the number equipped with couplers which may be coupled and uncoupled without the necessity of employes going between the cars, and the particular pattern, type or name of coupler; the number of cars not so equipped; the number of cars of each common carrier engaged in interstate commerce so equipped and the number not so equipped; the number of cars equipped by each common carrier during the preceding fiscal year and the pattern, type or name of coupler adopted or applied; the number, character and extent of injuries incurred and lives lost by employes while engaged in coupling or uncoupling cars, and the causes thereof.

And also a comparative statement of the progress made by each common carrier engaged in interstate commerce during the fiscal year in the adoption and ap-

plication of such couplers, by percentage of cars owned, leased or operated.

And also whether, in the opinion of the Interstate Commerce Commission, sufficient or reasonable progress is being made by said common carriers toward the adoption of uniform automatic couplers, and whether or not in its judgment legislation to expedite the adoption of a standard coupler is necessary or advisable.

Said Interstate Commerce Commission shall also ascertain and report in like manner in respect to power brakes on locomotives and continuous brakes on freight cars, including a statement of the number, character and extent of injuries incurred and lives lost by employees while engaged in operating hand brakes or in duties consequent thereto.

It shall be the duty of all common carriers engaged in interstate commerce to furnish to said Commission at any time and without unreasonable delay, in such form as may be prescribed by said Commission, such reports or information as may be deemed by said Commission necessary or desirable in carrying out the provisions of this act. And any common carrier, whether incorporated or otherwise, or any director or officer thereof, or any receiver, trustee, lessee, agent, or person acting for or employed by such common carrier, who shall willfully fail, refuse, or neglect to furnish such reports or information at such times as may be deemed necessary or desirable by said Commission shall be guilty of a misdemeanor, and shall, upon conviction thereof, in any district court of the United States, within the jurisdiction whereof such offense may be committed, be subject to a fine not exceeding five hundred dollars for every such offense.

The Virginia Railroad Law.

The Virginia Legislature, which discussed railroad legislation quite extensively during the early part of the present session, finally passed a law, to go into effect on June 1 next, which seems to make no very important changes. Although various wrong practices are forbidden, as, for instance, unjust discrimination, it does not appear that the law is designed to stop have been either numerous or flagrant in that State. The demand for a law like the Interstate Commerce Act seems to have been made, not by people who had been wronged by the railroads, but by politicians or others "on general principles." The feature of the law most talked about is that concerning free passes, though, so far as we can see from a cursory examination of the different sections, the law is drawn, in this particular, on the same plan as the Interstate Commerce law; that is to say, the giving of free transportation is not specifically forbidden, unless it be by the clause forbidding unjust discrimination, but there is a section, similar to section 22 of the Interstate Commerce law, *allowing* free transportation to certain classes. The original bill presented in the legislature enlarging the railroad commission and giving it power to make rates, and containing other radical provisions, was called the Kent bill. This was defeated, and the Mason bill substituted.

The Mason bill contains 21 sections, the chief of which may be summarized as follows: 1. The charge for transportation must not be greater for a short than for a long distance in the same direction, etc.; but the Railroad Commissioner may allow exceptions to this. Section 2 prohibits special rates, rebates and unjust discrimination. Section 4. Common carriers must interchange traffic impartially; but this shall not be construed as requiring a common carrier to establish or maintain unremunerative train service. Section 5 requires tariffs to be published; they must not be advanced except after 10 days' notice nor reduced except after three days' notice. Tariffs must be filed with the Railroad Commissioner. Section 6 prohibits false billing, false classification, etc. Shippers as well as railroad men shall be deemed guilty of misdemeanor for violation of this section. Section 7 compels the issue of duplicate bills of lading and makes it the duty of carriers to notify consignees of the arrival of freight; and they must give a reasonable time for the removal of freight, making due allowance for its class, for bad weather and holidays. Section 9. Railroads must maintain telegraph offices not more than 10 miles apart "for the protection of its train service by a competent person in the employ of the railroad company;" but the Railroad Commissioner may extend the limit to 15 miles in special cases. "It shall be the duty of every such operator to telegraph the arrival and departure of every train, as soon as it shall leave the depot or station, to the train dispatcher or other person regulating the running of trains, and if there be no such persons, then to the nearest telegraph office in the direction in which such train is going. The person receiving the telegram shall forthwith give such order or notification by telegraph as may be necessary to prevent any collision of trains." This would seem to be an attempt to prescribe the block system. Section 10 requires ticket offices to be opened 30 minutes before train time. Under section 11 certain reports heretofore made by the roads to the Board of Public Works must hereafter be made to the Railroad Commissioner. Section 12 requires the Commissioner to publish the railroad laws on May 1 of each year, and have them posted in every passenger and freight depot.

Aluminum.

The present condition of the production of aluminum and the prospects of cheapening it, and of its uses in the arts were the subject of a recent lecture by Maj. A. E. Hunt, President Pittsburgh Reduction Co., before the Franklin Institute. The lecture is published in the April issue of the *Journal* of the Institute and in a pamphlet reprint. We give extracts from the lecture.

but do not reproduce it nearly in full for two reasons. One is want of space; the pamphlet has 31 octavo pages, or a little over 12,000 words, which would fill three pages of the *Railroad Gazette* in the type in which the extracts given below are printed. The other reason is that much of the lecture is identical with a paper read before the New York Railroad Club March 19, 1891, and published in the *Railroad Gazette* March 27.

So while the whole lecture is a remarkably practical and sensible addition to the literature of the subject, we can give here only those parts of it that seem freshest, referring the reader to the earlier paper for many other facts.

Purity of the Products.—Aluminum is now being made throughout the world upon a commercial scale only by processes of electro-deposition from fused electrolytes. In this country the Pittsburgh Reduction Co. and the Cowles Electric Smelting & Aluminum Co. are the only concerns manufacturing commercially and furnishing the American market with aluminum. In Great Britain the Metal Reduction Syndicate, Limited, a branch of the Pittsburgh Reduction Co., and in Switzerland the Aluminium Industrie Actien Gesellschaft, manufacturing at Neuhausen, using the water power of the Falls of the Rhine, and in France the firm of Bernard Brothers, now building a works at St. Michaels, and operating the Minet process, are, so far as the writer's knowledge goes, the only manufacturers now whose metal is met in the competition of

conversion of indicated horse power into electrical we have 24 indicated horse power hours per pound of aluminum produced, or an expenditure of 48 lbs. of coal, which costs us 80 cents per ton at our works, or an expenditure for fuel of less than two cents per pound for the aluminum produced.

I do not much fear the solution of this portion of the "aluminum problem," adversely to the interests of those of us who are engaged in the electrolytic method of its manufacture. I assure you that I do not thus confidently assert the courage of my convictions without a reason therefor. I am constrained to take the position that I have, with the hopes of turning the inventive and skilled, as well as the popular, attention, to the fact that the next great source of cheapening aluminum will be a large demand for the metal, at present prices, sufficient to warrant outlay in plant to very greatly increase the capacity for manufacturing the metal. Aluminum will not be manufactured by any process at much less than at present, nor will it be sold at much lower rates, until the output be measured in tons, and not pounds, per day. The lowering of the market price of aluminum in the future will be gradual, and will be directly proportionate to the decrease in cost of manufacture, due to increased capacity of the manufacturing.

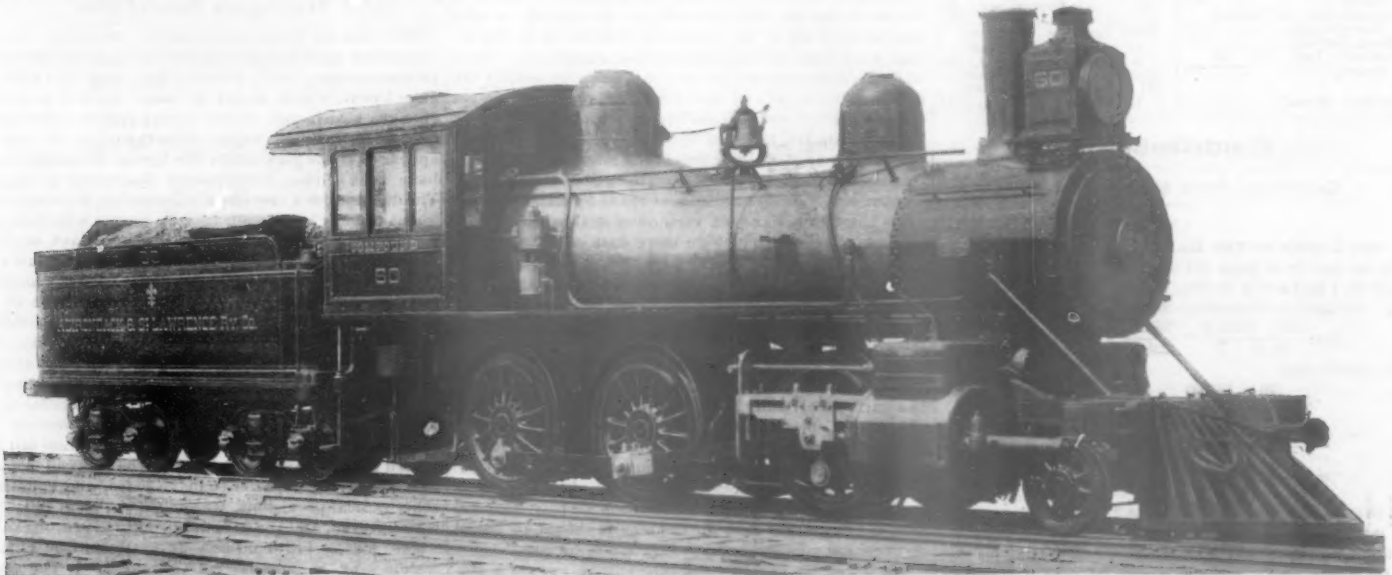
Uses of Aluminum.—In my judgment, the aluminum problem of by far the greatest movement yet remaining to be solved are in connection with the development of the uses of aluminum in the arts. Much has already been done in this matter, the demand for the metal increased tenfold over any previous year in 1891, yet very much more remains to be done. . . . The problems in-

gards strength, tenacity, hardness, rigidity and color, by alloying it with small percentages of other metals, conditions that do not materially change the specific gravity of the metal; the second is the relative weight of aluminum. Taking the tensile strength of aluminum in relation to its weight, it is in plates as strong as steel at 80,000 lbs. per square inch ultimate strength, and in cold drawn wire as strong as steel at 180,000 lbs. ultimate.

The specific gravity of aluminum, of course, is one of its most striking properties; it varies from 2.50 to 2.70. The weight of a given bulk of aluminum being taken as one, wrought iron is 2.90 times as heavy; structural steel is 2.85 times; copper, 3.60 times; ordinary high brass, 3.45 times; nickel, 3.50 times; silver, 4 times; lead, 4.80 times; gold, 7.70 times, and platinum, 8.60 times as heavy. Most woods that would be used for structural purposes are about one-third as heavy as aluminum. The specific gravity of aluminum is 2.56 in ingots and 2.64 in forged bars. A cubic inch of cast aluminum weighs .092 lb.; of rolled sheet metal, .028 lb.

	Weight in lbs. of 1 cu. ft.	Tensile strength per sq. in.	Length of bar in feet able to support its own weight.
Cast iron.....	444	16,000	535
Ordinary gun bronze...	525	28,000	2,268
Wrought iron plates....	480	50,000	15,000
Aluminum plates.....	165	26,000	23,000
(cold rolled) 164		33,000	29,615
(cast)..... 160		15,000	13,251
(forged).... 166		20,000	17,703

Wherever momentum is to be overcome, as in the reciprocal parts of many forms of machinery, aluminum can be advantageously used.



COMPOUND MOGUL LOCOMOTIVE.

Schenectady Locomotive Works.

the world's rapidly growing market for aluminum. . . . I am of the opinion that the aluminum problem of the cheapest method of production has been practically solved in the electro-deposition of the metal from fused electrolytes, and that only in details will this method be improved or this part of the aluminum problem be better solved. I am confident that the aluminum problem of quality, as determined by the purity of the metal, has been solved, and that upon a practical commercial scale, too, by several of the later methods of manufacture. . . . Both the Neuhausen concern and the Cowles, as well as the Metal Reduction Syndicate, Limited, of Patricroft, Lancashire, England, and the Pittsburgh Reduction Company, find no trouble by the electrolytic process in regularly producing metal with less than one per cent. of impurity. Indeed, the best results in quantity of output and regularity of working, and therefore in economy of manufacture, are when producing the purest aluminum, and it only requires further development of the manufacture of the aluminum oxide used as the ore and of the carbon anodes—matters which are perfectly practicable and possible—to obtain almost absolutely chemically pure aluminum by the electrolytic methods now in use. The Pittsburgh Reduction Co. have made a good many tons of aluminum of over 99.90 per cent. purity.

With these achievements accomplished, I claim that the problem of quality of the metal as evidenced by its chemical composition has been solved, and solved with fully as much perfection as is the case in the metallurgy of any of the other metals.

Cost of Production.—I have already, in a previous lecture in February, 1891, before the Boston Society of Arts, stated that the cost of manufacture under the most favorable conditions, with water power and large output, would be approximately 20 cents per pound. Nearly one year's experience and careful study of the matter leads me to reiterate the statement then made, and to prophesy that the ingot metal will be made by the Hall process within the next few years at a cost of between 18 and 20 cents per pound; the items of cost being about one-third for the ore, one-sixth for the expenditure of other materials than ore, one-third for the electrical current expended, one-twelfth for labor and superintendence, and one-twelfth for general expenses, interest and repairs. . . . In the item of electrical power, there certainly may be room for a curtailment of cost; but even should this expenditure of electrical power be lessened one-half, or entirely done away with, heat alone being substituted as the energy for reduction of the ore, it will be difficult to conceive of a method that would not require a cost of at least one cent for this heat, which would be a saving perhaps of four cents per pound upon this item of electrical power. The average energy expended per pound of metal produced by the Pittsburgh Reduction Co. is about 20 electric horse power hours, or each electric horse power hour of energy exerted upon the electrolyte yielding about 22½ grams of metal. . . . Our compound engines have a record of 2 lbs. of coal per indicated horse power hour, and with a 20 per cent. loss of potential in

involved in the development of the uses of aluminum in the arts have been under-estimated and have not received the intelligent consideration that the importance of the subject warrants. The world has been centuries learning to use other metals; we have a right to expect more rapid development with the increased general knowledge of to-day, yet it will at best take time to open the entire field that the metal is destined to fill. Within the past ten years, there have been two popular widely spread ways of solving this portion of the "aluminum problem," which are superficial, erroneous, and a hindrance to the true solution of the problem. The first, assuming properties for the metal that it did not possess, proclaimed that aluminum would, as soon as it could be produced in sufficient quantities, replace all the other metals in the arts, not only for the special purposes where the higher grade metals are now used, but also for structural and building purposes to replace iron and steel; the second view of the subject (the natural reaction from the first erroneous one, has become current within the past year or two, as the people began to use aluminum and found their ideals regarding it shattered; it is to the effect that the metal has little or no use in the arts.

Mr. Hunt considered at some length the recent statements made by German chemists, and widely published, that aluminum is unsuitable for culinary, domestic and manufacturing purposes because of its solubility in various acids. Some of these statements and the replies we have published from time to time in our "Technical" column. Obviously this is a branch of the subject into which we cannot enter at length, but we shall confine our extracts pretty closely to what may be called the engineering uses of aluminum.

For many purposes the purest aluminum cannot be so advantageously used as that containing three per cent., or even four per cent. of impurity, as the pure metal is very soft and not so strong as the less pure. It is only where extreme malleability, ductility, sonority or non-corrodibility is required that the purest metal should be chosen. For most purposes a small percentage of other elements than silicon and iron are advantageously added in producing hardness, rigidity and strength. Titanium, chromium and copper can readily and cheaply be added, and are constituents that will not detract from the non-corrodibility of the metal as much as do those natural impurities that come from the ore and apparatus—additions that will give the aluminum a better color and greater strength and hardness, with proportionately less sacrifice of malleability, ductility, etc.

The lecturer next considered the physical properties of aluminum, including experimental determinations of its elastic limit and tensile and compressive strength. These data and deductions appeared in the *Railroad Gazette*, March 27, 1891, page 213. He pointed out the peculiar usefulness of aluminum wire for electric conductors. This also was shown in the earlier paper.

Special Uses.—Two things should always be borne in mind in considering the applicability of aluminum for given purposes in the arts. The first is that the properties of the metal are very considerably changed as re-

For valves, for structural purposes, and for machinery where lightness is a prime factor, and where the wear due to the softness of the metal in bearings can be avoided by bushing, and its pliability can be overcome by properly designed sections, and by using metal hardened by alloying and by cold-rolling, drop-forging, or otherwise stiffening it up, the metal can be used advantageously and deserves further consideration.

Aluminum does not oxidize seriously so as to interfere at all with the strength of thin sections of the metal as does iron or steel. . . . As compared with most metals, pure aluminum, under ordinary circumstances, withstands the action of wind and weather exceedingly well, and many uses to which the metal is now being successfully applied are based upon this fact. The presence of silicon in aluminum materially detracts from its power to withstand corrosion due to atmospheric influences. Metal with four per cent. or five per cent. of silicon very soon collects a thick coating of oxide upon it, if severely exposed.

The fact that pure aluminum is not severely acted upon by boiling water or by steam has led to its successful use as a packing or gasket in steam connections, where lead and similar metals have been rapidly cut out, as in parts of steam and water pumps and difficult steam joints.

Aluminum is not acted upon by carbonic acid or carbonic oxide, or sulphuretted hydrogen, at any temperature less than 600 deg. Fahr., and these facts will undoubtedly lead to its application for many new purposes in the future.

Aluminum is found to withstand the action of organic secretions better than silver, and for many forms of surgical instruments and apparatus such as suture wires and tracheometer tubes, the metal is already receiving very wide use.

I take pleasure in exhibiting two plates of about 6 in. square each, one of aluminum and one of copper, which have been nailed upon the wooden sides of a schooner that has made a trip from New York to the West Indies and back, and were immersed in the sea water together for four months, showing that the copper sheet corroded the most under equal treatment. Unfortunately for the advantageous use of aluminum as a sheathing for ships, however, the barnacles seem to thrive on the aluminum sheet, a satisfactory evidence of the relative non-corrodibility of the metal, but not of its availability for certain marine purposes.

For structural purposes under water, where metals are required, aluminum seems to be especially adapted to replace the more easily corroded cast and wrought iron and steel now in general use for such purposes. For liners and shims upon masonry foundations, aluminum is well adapted, as it flows sufficiently to allow equal bearings on all parts, and is less easily cut out than lead, and much more durable than tinned iron sheets which are now in general use under heavy structures of metal resting on metal shims on masonry.

Aluminum sheets will make a much more durable and satisfactory roofing than sheet copper now generally used in valuable buildings, and sheet iron in other

Aluminum stands fourth, being preceded only by silver, copper and gold as a conductor of heat as well as electricity. . . . The electrical conductivity of a standard section of pure silver being taken at 100, an equal section of copper also at 100, pure gold at 78.0, an equal section of pure annealed aluminum has an electrical conductivity of about 54.20.

This relatively high electrical conductivity when equal weights are taken will undoubtedly prove a factor of importance in developing electrical uses for aluminum.

The electrical conductivity of aluminum is increased fully 5 per cent. by carefully annealing even the ordinary soft wire, and with hard drawn wire the conductivity is increased by annealing nearly 10 per cent. Pure aluminum has no polarity, and indeed the commercial metal in the market is practically non-magnetic.

Pure aluminum, when properly treated, is a very malleable and ductile metal. It stands third in the order of malleability, being exceeded only by gold and silver; and in the order of ductility seventh, being exceeded by gold, silver, platinum, iron, soft steel and copper. Both malleability and ductility are greatly impaired by the presence of the two common impurities, silicon and iron.

Aluminum can be rolled or hammered cold, but the metal is most malleable at, and should be heated to, between 350° and 400° Fahr., for rolling or breaking down from the ingot to the best advantage. Like silver and gold, aluminum has to be frequently annealed, as it hardens up remarkably upon working. In consequence

These diagrams are the best that have been published from a two-cylinder compound in this country. The combined diagrams show an economical use of steam such as could not be obtained in any kind of single expansion engine that it would be practical to make. The cards show the effect of inside clearance at low speeds, and in this way are instructive, as many have hesitated to use inside clearance on simple engines, fearing uneconomical results. The contrary is shown by card No. 75, where the speed is such that the transfer of steam from one end of the cylinder to the other, so clearly shown in cards Nos. 63, 64 and 65, has been reduced to such a small amount that it does not effect the indicator perceptibly. The improvement in the compression line on card No. 75 by the use of an inside clearance is worth attention. To cut out the inside of a slide valve is a decided advantage on a simple engine, even at moderate speeds, and an important and necessary step to take for a high speed engine, as shown by the admirable indicator cards from the Reading engine which we published recently.

It is evident from these indicator cards that the two-cylinder compound engine is now beginning to receive

from both directions. If O.K. is not received he must call each office until he gets it, and must then report again.

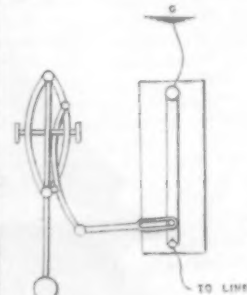


Fig. 2—Ground Switch.

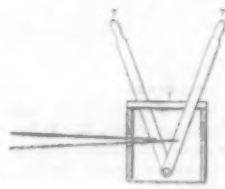


Fig. 3—Signal Levers.

To aid the operator in surely putting on the ground wire, after sending a report, the ground switch, fig. 2, has been devised and is used in some of the offices. This, it will be seen, is connected with the key in such a way that throwing the switch off opens the key, and closing the key puts the ground on again; while, so long as the ground is on, the key may be worked in the usual manner.

Fig. 4 shows an arrangement of circuits connected with the signal levers, which has been devised and patented by C. E. Buzzell, an operator at one of the stations on the line, for the purpose of sounding a continuous alarm on the sounders during the time that a semaphore is held down to admit a train to a section. The lower parallelogram represents the under surface of the cover of a box inclosing the lower parts of two vertical levers for operating the semaphores (box and levers shown in fig. 3). These levers are placed inside the telegraph office, and they project through slots, 6, in the top of this box.

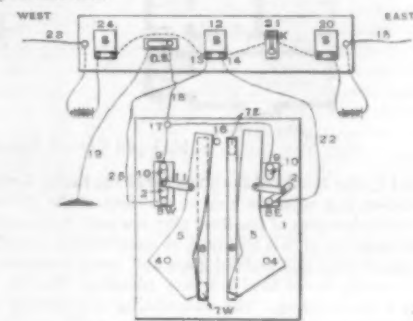


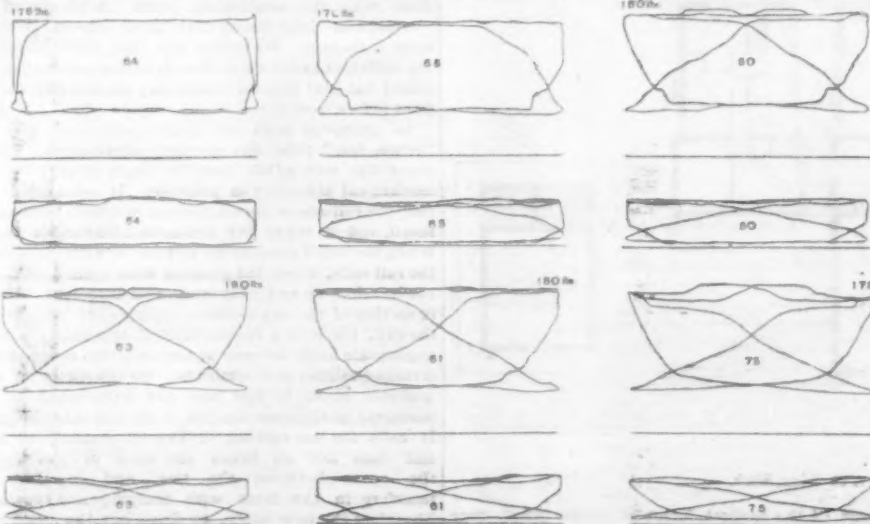
Fig. 4—Buzzell's Safety Device.

The position of the lever for the eastern signal is represented by 7 E and that of the western signal by 7 W; 5, 5 represent rocker arms fastened to the under side of the covers of the box by pivots, 4, 4, in such a way that, as will be seen, the movement of the signal levers opens or closes the switches 2, 2, controlling the currents through wires 23 and 25. When lever 7 E is moved to its opposite position (to the other end of the slot) it closes the switch on the east side, and in like manner the movement of 7 W to the other end of the slot opens the switch in wire 25. In the figure, the circuit from the east, wire 15, is broken at 8 E. The circuit from the Western wire, 23, goes to ground through 13, 25, 8 W, 17, 18 and 19. The breaking of the eastern circuit at 8 E throws the current through the automatic circuit breaker at 14, then through 13, 25, 17, to ground, and, the circuit breaker, or "buzzer," being now in circuit, there is a continuous alarm, thus warning the operator that the signal 7 E is down for admitting a train to the section. The western circuit, 23, operates in the same manner. If both switches, 2, 2, are open at the same time, the ground wire is entirely cut off and circuits 23 and 15 are connected together directly through the buzzer, 12, thus giving an alarm at the home office and at the stations in both directions.

By this apparatus an operator who disregards the rule requiring him to hold the semaphore down (instead of fastening it) and goes off about other work is reminded of what he has done, as long as he is within hearing of the buzzer or automatic sounder. Every time a train is admitted to a section the buzzer vibrates as long as the signal is down, so that the operator at the other end of the section has a special warning showing him (in all probability) the exact time that the train enters, and reminding him that he must not admit a train moving in the opposite direction (the road is single track). And if an operator, say at A, should blunder and admit a train to the section A B before he had received the consent of B, his action in pulling down the semaphore would at once notify B and quite likely give him time to correct any dangerous error on A's part.

Ore Dock Contract.

The Duluth & Winnipeg has let the contract for building ore docks at the mouth of the Nemadji River, on Alouez Bay, Superior, Wis., to Grant, Foley Brothers & Guthrie, of St. Paul. These docks will be used jointly by the Duluth & Winnipeg and the Duluth, Mesabe & Northern.



INDICATOR DIAGRAMS TAKEN FROM SCHENECTADY MOGUL LOCOMOTIVE.

The figures at the upper corners show the boiler pressure.

of this phenomenon of hardening during rolling, forging, stamping or drawing, the metal may be turned out very rigid in finished shape, so that it will answer excellently well for purposes where the annealed metal would be entirely too soft, or too weak, or lacking in rigidity to answer. Especially is this true with aluminum alloyed with a small percentage of titanium, copper or silicon. It can be safely stated, as a general rule, that under similar conditions, the purer the aluminum the softer and less rigid it is.

The very remarkable results that have been obtained with aluminum bronzes and with aluminum-Babbitt for bearings were pointed out. These may also be found in the paper before cited. Mr. Hunt closed his lecture with a brief account of a dozen or more curious and useful alloys that have been discovered by different investigators which indicate some of the probable uses of the metal and which show how carefully this field of investigation is being worked.

Adirondack & St. Lawrence Compound Mogul Locomotive.

The Schenectady Locomotive Works has recently built three compound mogul freight engines for the Adirondack & St. Lawrence road, of the design shown by the accompanying illustration made from a photograph. The general dimensions of these engines are as follows:

Cylinders, 20 and 30 in. x 28 in.
Drivers, diameter, 37 in.
Boiler, wagon top, diameter at front end, 58 in.
Firebox, 101 in. x 43 1/2 in.
Tubes, number, 205.
Do, diameter, 2 in.
Do, length, 11 ft. 6 in.
Boiler pressure, per sq. in., 180 lbs.
Driving axle journals, 8 in. x 9 in.
Engine truck axle journals, 6 in. x 10 in.
Tender axle journals, 4 1/2 in. x 8 in.
Weight on drivers, 111,500 lbs.
Weight on truck, 18,000 lbs.
Total weight, 129,500 lbs.
Travel of valves, 6 1/4 in.
Outside lap of valves, 1 1/2 in.
Inside clearance of valves, high pressure, 1/8 in. each side.
Inside clearance of valves, low pressure, 1/8 in. each side.

The capacity of the tender is 4,000 gallons of water and eight tons of coal. We give some indicator cards taken from one of these engines when hauling 55 loaded freight cars on the New York Central & Hudson River road. The engine hauling this train steamed freely with a 5 in. exhaust nozzle. The following table gives the data from the indicator cards:

No. of card.	Rev. per minute	Piston speed in feet per minute.	Miles per hour.	Point of cut-off in inches.				Horse power.	Per c. of work done in L. P. cylinder.
				H.	P.	L.	P.		
64	40	173.3	6.78	21 1/2	22 1/2	18 1/2	18 1/2	367.7	62.53
65	72	312	12.2	17	18 1/2	13 1/2	13 1/2	328.4	50.17
66	104	450.6	17.63	13 1/2	14 1/2	10 1/2	10 1/2	287.5	52.51
67	106	460	18.31	12	13 1/2	9 1/2	9 1/2	269.3	51.21
68	104	450.6	17.63	11 1/2	12 1/2	8 1/2	8 1/2	247.7	42.13
69	104	450.6	17.63	10 1/2	11 1/2	7 1/2	7 1/2	202.8	31.33

the careful designing and proportioning which it so well deserves.

Block Signaling Apparatus on the Chicago, Milwaukee & St. Paul.

As our readers may remember, the signaling of trains, so as to keep them a station apart, is done by the station operators on the Chicago and Council Bluffs Division of the above-named road by means of Morse circuits, arranged somewhat differently from those usually employed. The sounders are worked directly, without relays, and are so arranged that they can be made extra loud, when desirable, for the benefit of operators whose duties often call them outside the office. We give below the substance of the rules under which these circuits are operated.

The normal condition of the "block wire" is a circuit from any one station to the next station east or west. Sounders of 25 ohms each are used where distances do not exceed eight miles between stations. Two cells of battery per mile is the usual rule. The operator places his key on the west side of the ground switch when signaling ahead for east bound trains, and on the east side when signaling ahead for west bound trains. There are two sounders, one key and one ground switch at each station, except terminals, and batteries at each alternate station. The ground switches are kept turned to the west side of the key by means of a spring, because more work is done east than west.



Fig. 1—C., M. & St. P. Ry. Block Signal Circuits.

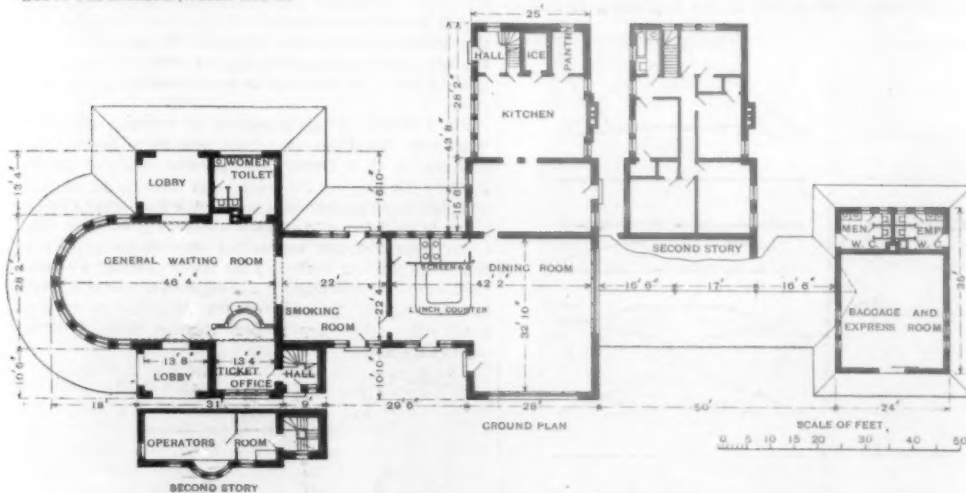
No business except that pertaining to the blocking of trains may be done on this wire. The operator must always keep the ground switch turned on either the west or the east side (except when working with the stations east and west at the same time), thus preventing signals reaching a station not interested in the business being done. Operators will then understand that any signals they hear on "block" instruments are intended for them, and that such signals must receive attention at once.

When reporting a train the operator must hold the ground switch between the two points, call each office three times, sign his call and report; then close the ground switch at once to enable him to receive O.K.

Michigan Central Passenger Station at Niles.

The perspective and plan drawings shown herewith afford a good illustration of the new station of the Michigan Central at Niles, Mich., recently erected under the supervision of Chief Engineer J. D. Hawks, and his assistant, C. W. Hotchkiss. The building is made of Ohio brown sandstone and is 98 x 40 ft., with a wing 40 x 24 ft. The tower near the centre is 68 ft. high. The baggage room, 22 x 35 ft., is 55 ft. east of the main building, the intervening space being roofed over.

The plan shows the main floor, but the rooms immediately over the ticket office are shown below the main plan, and the rooms above the kitchen (which are oc-



Michigan Central Passenger Station at Niles, Mich.

cupied by the family of the manager of the eating-house, are shown in a separate plan at the right of the kitchen. The other features of the floor plan are self-explanatory.

The interior of this building is exceedingly tasteful, the use of plate and stained glass and brass ornamentation having served to give a very pleasing effect in all parts of the building. The wainscoting and ceilings are quarter-sawn and carved oak, and the walls are decorated in light terra cotta. The building is heated by hot water. The tower has an illuminated clock, with 5-t. dial, made by Howard Brothers, of Boston.

The grounds around this station are laid out on a well-designed plan and there is an abundance of trees and shrubbery. There is a trout pond near the east end. We regret that our illustration fails to show the 90 ft. greenhouse, just beyond the baggage room, where the Chief Engineer raises the flowers with which he decorates the 80-lb. rail sections that he presents to the ladies on the North Shore Limited as it passes Niles.

The "Triple Fish" Rail Joint.

The rail joint recently patented by Mr. Clark Fisher, and called by him the "triple fish" joint, belongs to the class designed to support the rail from the base and not from the head. In the use of this most rational principle it resembles the well-known Clark Fisher "bridge" joint. Further than that the resemblance is rather apparent than real. The "bridge" joint is intended to support the rail ends at an absolute level and thus provide for perfect surface. It makes, however, no special provision for line. The "triple fish" joint is intended, not to support the rail ends at an absolute level, but to keep them at the same level relatively one to the other. In other words, it is a suspended joint, but much more efficient and powerful than the simple angle-plate joint. The provision for holding the rail ends in line with one another is also unusually efficient.

The new joint seems to be not only a development of the "bridge" joint but a reversion to, and improvement

upon, one of the earliest forms of Fisher joint, once largely used on the Lehigh Valley Railroad and shown in Trautwine's "Pocket Book." That was a suspended joint with a base plate 6 in. square and two clips 6 in. long, to go over the rail flanges, and two U-bolts. The clips did not extend up to bolt against the web of the rail, as they do in the new "triple fish" joint.

The new joint is so well shown in the cuts as to need little description. There are three plates, three U-bolts and two fishing bolts. The rail ends are held to the same level by the action of the U-bolts applied to the base of the rails through the plates. It will be seen that a powerful strain may be applied, precisely in the direc-

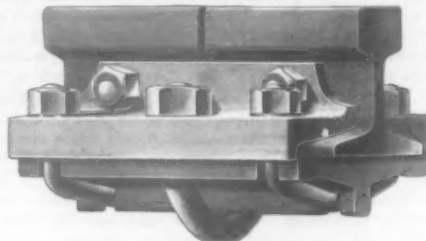


Fig. 1—Triple Fish Rail Joint.

tion in which it is required to act. In this respect the "triple fish" joint has a great advantage over the angle-plate joint and over most of the patented joints. The accurate alignment of the rail ends is effected by the action of the two horizontal bolts through the webs of the two upper plates. These bear against the web of the rail and not against the head. Thus there is none of the wedge action of the angle joint; there is ample area of contact and the strains are direct. The downward thrust of the load does not act to displace the joint laterally. The whole construction, having in view the two real functions of a rail joint, is mechanical and substantial. We suggest, however, one possible trouble-

that the rails will be held so firmly that they cannot slide in the joints as they change length under variations of temperature, and hence there will be buckling.

Each rail end has but one bolt hole and the flanges are clipped for the middle U-bolt.

As compared with the Fisher "bridge" joint the new joint has some advantages. The only serious objections that we have ever heard to the bridge joint are two: That it does not positively bring two adjacent rail heads into line and that it is inconvenient in renewals of rails on busy roads. It is also said that track men dislike to renew or adjust the U-bolt when the ground is covered with snow. This last objection, however, seems rather whimsical; the others are undoubtedly weighty. If the bottom of the flange of the rail is not exactly at right angles to the web, or if the flange of one rail is not filled out to its full width in the rolls, or if the surface of the bridge is a little winding or irregular, or if several of these defects coincide, as they easily may, for none of these parts are finished to a machine fit, there will be more or less error of alignment. The inconvenience of the "bridge" joint in renewals consists in this, that it is impracticable to connect a long line of rails together and then slip them into place between two trains, as is done with the angle-plate joint. A glance at the "triple fish" joint shows that these objections do not exist in its case. We do not say that these objections are sufficient to outweigh the advantages of the "bridge" joint; but that to some minds they do, and that the new joint is free from them.

As compared with the angle-plate joint also, the "triple fish" joint has decided advantages. Almost every one will admit that the angle-plate joint is a mechanical absurdity in principle. It attempts to support the rail where the supporting surface is of necessity small, and it takes the strains at unfavorable angles. When the small supporting surface is worn just under the rail ends, where the greatest wear comes, slack cannot be taken up and play and wear increase. Changes in section of the angle-plates mitigate but do not cure the evil, for it is a radical fault of principle. Still the angle-plate holds its own against all the new joints by certain qualities of availability. Its simplicity of form makes it cheap in first cost, and a trackman of very moderate intelligence can put it on and take care of it. It calls for no cutting of ties or slotting of rails, and does not go below the base of the rail in the space between the ties, and so does not interfere in the least with tamping and drainage. Therefore the new joints, to drive out the angle plate joint, must not only do the proper work of a joint better, but must not have any very objectionable qualities. An examination of the "triple fish" joint will show that it holds up the rails from the base; that it holds them down also by a very robust arrangement; that it holds them in line by fishing directly against the web; that it requires no cutting or lowering of joint ties, and that while it has more parts than the angle joint it is still simple enough for the average trackman. No man can say what a rail joint is worth until it has been tried in track under a variety of conditions; but any man who has paid much attention to this complicated problem will see that the "triple fish" joint is worth thorough trial. More than that cannot be said of any new joint.

Standard Tests for Air Brakes.

The following are the standard tests for the efficiency of air brakes as revised by the M. C. B. committee after the meeting held at Chicago, April 22:

Conditions of Tests.—1. Brakes will be tested on a rack representing the piping of a 50 car train (34 ft. cars). All cocks, screens, angles and connections will be as nearly as possible identical with those in train service. A drawing will be provided (Plate 1) showing what shall constitute the proper fittings, piping, dimensions of cylinder, of auxiliary reservoirs, main reservoirs, engineer's valve, etc. 2. Tests will be made with a uniform train pipe pressure of 70 lbs. 3. Triple valves must be constructed so that they can be secured and operated on apparatus conforming to the diagram (plate 2). 4. To secure accuracy in measurement of time in application and release tests, electrical recording apparatus will be used. 5. Tests shall be repeated at least three times under the same general conditions. The temperature at the time of the tests will be recorded.

Tests.—1. Application Test. (a).—Brakes must commence to apply on the fiftieth car in three seconds, or less than three seconds from the first movement of the engineer's valve handle, and must indicate at least 55 lbs. in the cylinder of the fiftieth car in 3½ seconds or less from the first movement of the engineer's valve handle. This test will be made with (1) 6-in. piston travel, (2) 12-in. piston travel, (3) 4-in. piston travel. The object of this

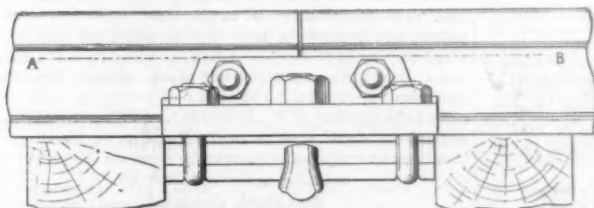


Fig. 2—Elevation.

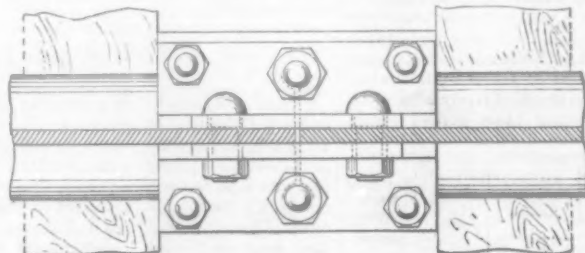


Fig. 3—Plan on Line A B.

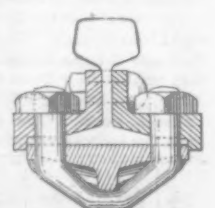


Fig. 4—Cross-Section through Centre.

THE "TRIPLE FISH" RAIL JOINT.

Made by the FISHER RAIL JOINT WORKS, Trenton, N. J.

time limit is to secure, in actual service, a minimum length of stop, and shock and break-in-twos.

2. Application Test. (b).—Commencing with the fifth car from the engine, the air from the reservoirs of three successive cars will be cut out; the brakes will then be applied as per test No. 1. The emergency action should pass these three cars, and apply on the fiftieth car in the same time as in test No. 1. Tests will be made with piston travel of 6-in., 12-in. and 4-in. In freight service the most common method of remedying a defective brake is to cut the brake out; hence it is essential that a limited number of cars can be cut out successively without destroying the emergency feature.

3. Graduating Test. A train-pipe pressure of 70 lbs. having been secured, the following tests will be made: (a). A reduction of 10 lbs. in train-pipe pressure. This should lightly apply the 50 brakes. (b). A further reduction of 4 to 6 lbs.; this should increase the braking power on all the brakes. (c). A reduction to 30 lbs. should equalize the pressure between the auxiliary reservoirs and brake cylinders. The piston travel in this test will be 6 in.

4. Test to determine sensitiveness of the emergency valve. Three valves selected at random will be taken for this test, and each tried separately. The engine and tender brake should be connected. A train-pipe pressure of 70 lbs. having been secured, the air will be discharged as rapidly as it may through an opening in the engineer's valve of $\frac{1}{2}$ in. Under this condition the emergency action must not take place. The object of this test is to check the introduction of triples which will cause an emergency application when not wanted.

5. Test to determine the holding power of the brake in service application and emergency application. (a). Service Application.—Gauges will be placed on the cylinder and auxiliary reservoir of the first, 25th and 50th cars, with 70 lbs. train pipe pressure. Brakes will be applied by admitting, as nearly as may be, 15 lbs. into the cylinder of the first car. Record of pressure in the auxiliary reservoirs and cylinders will then be taken as follows: (1) At the first application; (2) in five minutes from first application; (3) in 10 minutes from first application; (4) in 15 minutes from first application. (b). Emergency Application.—This will be the same as the above, except that all the air will be exhausted from the train-pipe.

6. Release Test.—The following conditions should be observed in this test: (a). Boiler pressure, 100 lbs. (b). Main reservoir cut out. (c). Pumps with 8-in. steam cylinder and $7\frac{1}{2}$ -in. air cylinder. A uniform pressure of 70 lbs. having been secured in the train-pipe, all the air will be exhausted by an emergency application. The train-pipe will then be fed up to 63 lbs. from the main drum, wherein will be kept a uniform pressure of 90 lbs. The feeding in will take place through a diaphragm having a hole about $\frac{1}{2}$ in. diameter, the exact size being as yet undetermined. Then a record will be taken of all brakes that have been released. This test, in addition to testing the release features of the triples, is intended as an equivalent to a break-in-two in train service.

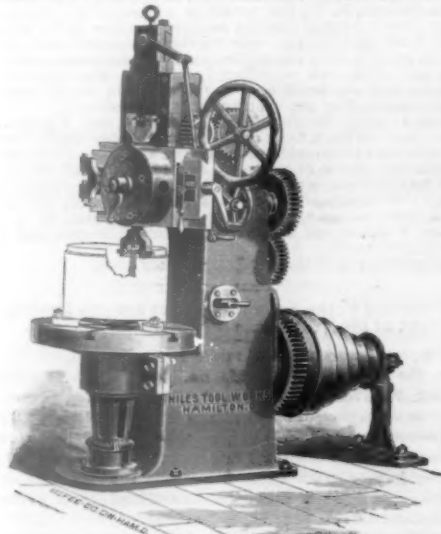
7. Test to determine the time of charging one auxiliary reservoir. (a). Cut out the car to be tested at the cut out cock. (b). Bleed the auxiliary reservoir empty and close the bleed cock. (c). Secure 90 lbs. pressure on main air reservoir and train-pipe. (d). Shut off the pump. (e). Cut in the car to be tested and note from the reading of the gauge the time occupied in charging to 70 lbs.; the time should not exceed 60 seconds, nor be less than 45 seconds. The object of this test is to prevent irregular charging of auxiliary reservoirs, and thus assure that the front brakes will not apply after charging.

Train Tests.—1. In order to provide against defects which a rack test may not develop, it is recommended that railroads make a 50-car train test in actual service before accepting the result from the rack test as final. 2. In making application test Nos. 1 and 2 with a train, the measurement of time from the first car to the fiftieth car should also be provided for. This will determine the time occupied by the engine brake as against the car brake. 3. Special care should be taken with the engine and tender brakes in order that they may do their share of the braking during the stops and not pull away from the train. 4. All brake shoes must have a proper bearing on the wheels, which is best accomplished by giving them some previous service before testing. 5. Tests to determine the shock should be made on a level track with all the slack in the train pulled out at the time the brakes are applied.

G. W. RHODES, E. B. WALL, GEO. GIBBS, Committee.

Combined Boring and Turning Machine.

The accompanying cut shows a new turret machine designed by the Niles Tool Works, of Hamilton, O.,



Combined Boring and Turning Machine.

for general boring and turning of small work, and for the special duty of turning piston rings for locomotives or other steam engines, the turret principle being em-



CLOSET FOR BAKER CAR HEATER.

The Baker-Heater Closet.

Mr. W. C. Baker, whose improvements in car-heaters during a quarter of a century have made his name a technical railroad term, has designed a car-heater closet which is as nearly fireproof as a wooden enclosure can be, and prevents gas and smoke from being distributed through the car. Within a space 24 ins. square, floor area, he encloses the entire heater and its immediate connections, as well as a coal bin of the usual capacity. Over heating of the closet is prevented by the gratings at the top and bottom, whereby the natural draft will send the hot air into the car. Through the lower grating is also taken the air supply for the fire. The closet door is kept closed except while tending the heater. The usual plan in sleeping-car heater-closet doors of having the grating or slats extend the entire length of the door does not induce a circulation, while top and bottom gratings cause it to "draw" like a chimney.

The engraving shows the closet with the furnace open, showing the safety plate above, with its shank to turn up and allow the coal to run down from the elevated coal bin to the fire.

Next above the coal bin, and its door through which the coal is supplied to the bin, is the circulating water-supply drum. To this drum are attached the water-feed cock and funnel, or combination cock, and the pressure gauge. Also connected by a single pipe run through the car roof is the expansion air-drum (a new addition to the circulating drum) and the safety vent screwed into it.

The smoke pipe and its cowl on top are seen at the left. The cowl is a new design. It is of cast iron, and in one piece. It is held on the pipe simply by its own weight and the friction of the three clamps or legs, shown. It is so attached to the smoke pipe that in case

it strikes any object it is simply knocked off without injury to anything else. A ventilating tube to draw off the gas that may accumulate in the elevated coal bin is partially shown running behind the smokepipe and through the car roof.

The two heater pipes, the up flow and the down flow, are also partially seen at the right running down, out and back after making the heating circuit of the car.

Train Accidents in the United States in March.

COLLISIONS.

REAR.

1st, on Chicago, Milwaukee & St. Paul, near Mason City, Ia., a freight train ran into a preceding freight, wrecking the caboose, which was burned up. Two stockmen, 2 brakemen and 2 others were injured.

7th, 4 a. m., on New York Central & Hudson River, at Rochester, N. Y., a freight train which had been stopped because of a breakage on the engine was run into at the rear by passenger train No. 5, damaging the engine and several cars of the passenger train, and the engine which was attached to the hind end of the freight. It is said that a flagman sent back from the freight went on the wrong track and failed to signal the passenger train.

7th, on Cleveland, Cincinnati, Chicago & St. Louis, near Cleves, O., a passenger train ran over a misplaced switch and into the rear of a work train standing on the side track, killing the fireman and injuring the engineer.

7th, evening, on Lehigh Valley road, at Easton, Pa., a passenger train near the station was struck at the rear end by two loaded cars which had escaped on a grade and run some distance uncontrolled. One passenger car was badly damaged and a passenger injured.

10th, 4 a. m., on Cleveland, Cincinnati, Chicago and St. Louis, near Acton, Ind., a westbound freight train which had unexpectedly stopped was run into at the rear by a following freight, making a bad wreck and killing a conductor and a brakeman.

16th, on Delaware, Lackawanna & Western, near Washington, N. J., a freight train ascending a grade broke in two, and the rear portion ran back into the head of a following freight, making a bad wreck. A man in the caboose was seriously scalded.

17th, on Chesapeake & Ohio, near Ronceverte, Va., an eastbound passenger train ran into the rear of a preceding freight in a tunnel, badly damaging several freight cars and injuring 3 trainmen.

19th, on Rome, Watertown & Ogdensburg, near De Kalb, N. Y., a paymaster's train ran into the rear of a passenger train, badly damaging the engine and car. Conductor and 1 passenger injured. There was a severe snowstorm at the time.

23d, on Detroit, Grand Haven & Milwaukee, at St. Johns, Mich., rear collision of freight trains, wrecking caboose and injuring a brakeman.

24th, on Pennsylvania road, near Gap, Pa., an eastbound freight train ran into the rear of a preceding freight, wrecking several cars. Conductor injured.

25th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Columbus, Ind., a freight train which had stopped with its caboose on a long bridge was run into at the rear by a following freight, wrecking the caboose, which was set afire by the coals in the stove. One span of the bridge was badly warped by the heat. The fire was finally extinguished by the city fire department. A brakeman was fatally injured and two men were badly hurt by falling from the bridge while engaged in putting out the fire.

27th, 1 a. m., on Baltimore & Ohio, at Wellsboro, Ind., a passenger train standing at the station was run into

ployed to bring into successive action the different tools necessary to complete such rings.

The turret saddle is mounted upon a substantial cross rail fixed to a vertical slide in the column. The table receives motion from a cone having five steps for a 4-inch belt. The cone is strongly back-gearred, this affording ten changes of speed for the table. Four power feeds are provided, the change from roughing to finishing being made instantly by means of a small lever projecting from side of column. Quick hand adjustments are also provided to facilitate setting.

In the illustration a casting for piston rings is shown in outline secured to the table. The turret carries three special tools for finishing the rings without stopping. The tool standing upright in turret is for the first or roughing cut; it has two cutters which act on the inside and outside simultaneously and bring the ring approximately to size. The tool shown operating on the casting carries three cutters for finishing, one each for the inside and outside of the ring, while a third faces the top or edge, all at the same time. The third tool has two cutters for cutting the ring off, these being fed toward each other from the inside and outside of the ring. When once set, the different tools can be made to perform their respective duties again and again, and the work when done will be uniform.

This tool loses none of its advantages as a general machine on account of its peculiar fitness for turning piston rings. By means of a taper dowl, the turret is secured over the centre of the table for boring with double-ended cutters and for general chucking work.

The machine will swing 31 in. diameter, having a table 30 in. diameter, and has a clearance under overhang of column of 18 in.

at the rear by a freight train, making a very bad wreck, most of which was burned up. Engineer and fireman injured. It is said that the engineer of the freight failed to observe the signal that was sent back.

27th, 4 a. m., on New York, Pennsylvania & Ohio, at Mansfield, O., an eastbound freight train which had stopped to take water, was run into at the rear by a following freight which had become uncontrollable on a descending grade on account of the breakage of a coupling, a large part of the train being left without sufficient brakemen upon it. The engineer of the standing train tried to get out of the way, but started so suddenly that he broke a coupling. A brakeman and a pedestrian were injured.

27th, on Lake Shore & Michigan Southern, at Sylvania, O., a freight train waiting for orders was run into by a following freight which approached at considerable speed. Engine, caboose and a number of cars damaged. The engineer of the colliding train was badly injured, and the engineer of the foremost train was thrown from his engine and slightly hurt.

29th, on Philadelphia & Reading, near Frackville, Pa., a freight train descending a steep grade became uncontrollable and ran into an empty engine ahead of it, which was running backward, making a very bad wreck, in which 40 cars were piled up, and killing 2 brakemen who were on the buffer beam of the empty engine, probably asleep. The engineer and fireman of the freight train saved themselves by jumping.

29th, on Flint & Pere Marquette, near Meredith, Mich., a freight train ascending a grade broke in two, and the rear portion ran back down grade, colliding with an empty engine and injuring an employee.

31st, on Louisville & Nashville, near Evergreen, Ala., a freight train ascending a long grade broken in two and the rear portion ran back down grade and collided with a following passenger train, the engine and forward cars of which were badly damaged. A postal clerk was killed; fireman, express messenger and another postal clerk were injured.

31st, on Louisville, Evansville & St. Louis, at Beck's Siding, Ind., a freight train ran over a misplaced switch and into some freight cars standing on the side track, wrecking the engine and 9 cars. Four trainmen injured, two of them seriously.

And 23 others on 15 roads, involving 5 passenger and 30 freight and other trains.

BUTTING.

3d, on Kansas City, Memphis & Birmingham, near Danville, Ala., butting collision between a coal train and a work train, causing the death of two laborers. The work train was moving backward, and had sent out a flag, but it appears that the flagman did not go far enough.

5th, on Baltimore & Ohio, at Rockville, Md., butting collision between a westbound passenger train and an empty engine, badly damaging both engines. A brakeman and a fireman were killed; engineer and express messenger injured.

8th, 11 p. m., on Illinois Central, near Hazlehurst, Miss., butting collision between freight trains, both running at considerable speed, making a very bad wreck and killing a fireman. Three other trainmen were injured. It is said that a dispatcher's mistake was the cause of the collision.

10th, on Northern Pacific, at Lake Park, Minn., a butting collision between a snow plow and an engine, badly injuring one engineer.

12th, on Union Pacific, near Granville, Colo., butting collision between a freight car which had become uncontrollable on a descending grade and a passenger train, wrecking the car and killing a freight conductor who was upon it endeavoring to set the brake. This conductor's train, in going upon a side track near by, had pushed the car over the safety block.

15th, on Colorado Midland, near Woodland Park, Colo., a pushing engine descending a grade ran into a freight ascending, wrecking both engines. One fireman was injured by jumping. It is said that the freight had been ordered to keep out of the way of the empty engine.

16th, on Richmond & Danville, near Atlanta, Ga., a passenger train ran over a misplaced switch and into the head of a freight train standing on a side track, badly damaging both engines. Two passengers injured.

17th, on New York Central & Hudson River, near East Bloomfield, N. Y., butting collision between freight trains, said to be due to the failure of an operator to hold one of the trains. Both engines and 7 cars were wrecked.

20th, on Philadelphia & Reading, in Germantown, Pa., a freight engine became uncontrollable on account of the breaking of the throttle and ran some distance toward Philadelphia until it met a passenger train. Both engines were somewhat damaged and the glass in a number of cars was broken. The passenger train, which was standing at the station, was pushed 150 ft. The engineer of the runaway engine was injured by jumping.

21st, on Monongahela River road, near Fairmount, W. Va., a mixed train, running with the engine at the rear, ran into a freight train, making a bad collision and wrecking a passenger car, which at once took fire. One passenger was burned to death and 3 employees were injured.

30th, on Richmond & Danville, near Lincoln, Ala., butting collision between eastbound freight train No. 27 and westbound extra No. 556, both engines and a number of cars being considerably damaged and a brakeman killed. It is said that the crew of the extra forgot its orders.

And 5 others on 5 roads, involving 0 passenger and 10 freight and other trains.

CROSSING AND MISCELLANEOUS.

1st, on New York, Lake Erie & Western, near Warsaw, N. Y., an eastbound Erie freight and a westbound Lehigh Valley freight collided, making a bad wreck. A brakeman riding on the Erie engine was fatally injured. The fireman of the foremost engine of the Erie freight was injured internally.

1st, on Chicago, Milwaukee & St. Paul, in Milwaukee, Wis., a passenger train ran over a misplaced switch and through a crossover into the side of a train running on an adjoining track, carrying a large number of workmen from the shops of the company, who were being carried in freight cars. One of these cars was overturned and 7 workmen were killed. Only 1 person was injured.

3d, at 2 a. m., on Chicago, Burlington & Quincy, at Hinsdale, Ill., two eastbound freight trains, running on adjoining tracks, came together at a crossover track, where the switch had been left wrong, and 2 brakemen were killed. It is said that the collision occurred at the end of the third track, and that the switchman in attendance went to sleep and failed to change the switches

at the hour prescribed for the westbound trains to clear the third track for the use of eastbound trains.

9th, on Manistee & Northeastern, near Manistee, Mich., a freight train, switching on the main track, was run into by another freight, making a bad wreck and injuring a brakeman. It was snowing fast at the time.

10th, on Pennsylvania road, at Herr's Island, Pa., a passenger train ran over a misplaced switch and collided with an engine on the side track, doing considerable damage. One passenger was injured.

22d, at Odin, Ill., an Illinois Central freight train ran into an Ohio & Mississippi passenger train at the crossing of the two roads, cutting the passenger train completely in two and wrecking one passenger car, in which were 17 passengers. All of them were injured, but it appears that only three or four were seriously hurt.

24th, on Texas & Pacific, at Choctaw, Tex., a westbound freight train ran into a work train engine which was on or near the main track without orders, derailing both engines and one car, which went down a bank. Engineer and fireman fatally injured.

31st, on Baltimore & Ohio, at Zanesville, O., two gondola cars loaded with brick got away from the trainmen and ran down grade until they collided with a passenger train, wrecking the engine and damaging a baggage car. The engineer and fireman escaped serious injury by jumping.

And 10 others on 10 roads, involving 5 passenger and 15 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

7th, 9 p. m., on East Tennessee, Virginia & Georgia, at Dahes Ferry, Ga., a passenger train was derailed by a broken rail, one baggage car being overturned. The passenger cars were badly damaged and 3 passengers injured. A number of others were more or less burned by coals from overturned stoves.

8th, on Michigan Central, near South Rockwood, Mich., a passenger train was derailed by a broken rail, a mail clerk being injured.

8th, on Denver & Rio Grande, at Del Norte, Colo., a car in a passenger train was derailed and ditched by a broken rail, 4 passengers being badly injured. The car caught fire, but the flames were soon extinguished.

10th, on Terre Haute & Indianapolis, near Terre Haute, Ind., 3 cars of passenger train No. 8 were derailed and badly damaged by a defective frog. A brakeman was seriously injured and several passengers slightly hurt.

14th, on Wisconsin Central, near Dale, Wis., passenger train derailed by a broken rail, several cars being burned. A brakeman was killed and an express messenger and 5 passengers injured. One of the latter was badly burned by an overturned stove, his injuries being reported as fatal.

15th, on Southern Pacific, near Sanderson, Tex., a freight train ran upon a burning bridge, and fell through it into a deep cañon, 12 loaded cars being destroyed.

16th, on New York Central & Hudson River, near Brockport, N. Y., passenger train derailed by broken rail, 2 cars going down an embankment. A brakeman who was deadheading over the road was injured.

21st, on Findlay, Fort Wayne & Western, near Findlay, O., a passenger train was derailed by a broken rail, several cars being badly damaged and a baggage car completely wrecked. The engineer and fireman were injured, probably fatally. Four passengers were badly hurt.

24th, on Utah Central, near Park City, Utah, a car of a passenger train was derailed and overturned at a point where the roadbed had been weakened by rain. The conductor and 12 passengers were injured.

24th, on Central of Georgia, near McCormick, S. C., the rear car of a passenger train was derailed by a broken rail and overturned. Four passengers were injured.

29th, on St. Louis, Keokuk & Northwestern, at White Rock, Mo., the forward end of a freight train was derailed by a split rail and wrecked, the fireman being badly scalded and the engineer injured by jumping.

31st, on Southern Pacific, near Bakersfield, Cal., a switch engine was derailed by a broken rail and overturned, severely injuring the engineer.

And 6 others on 6 roads, involving 1 passenger and 5 freight and other trains.

DEFECTS OF EQUIPMENT.

2d, on Baltimore & Ohio, near Bridgeport, W. Va., 5 cars of a passenger train were derailed and badly wrecked by the breaking of a driving axle, 15 passengers being injured.

2d, on Baltimore & Lehigh, near Baldwin, Md., a passenger train, running slowly, was derailed on a high bank as it approached a trestle, the whole train except the rear car falling down the bank or off the trestle. The express agent and mail agent were badly hurt, and several passengers were somewhat injured. The baggage car took fire from the stove, but the flames were soon extinguished. The passenger cars were heated by steam from the locomotive. It is thought that the derailment was caused by a breakage in one of the trucks of the baggage car.

6th, 1 a. m., on Texas & Pacific, near Finley, Tex., a freight train was derailed by a broken truck wheel on the engine, wrecking the engine and several cars and killing the engineer.

7th, on Pennsylvania road, near Coatesville, Pa., freight train derailed by a broken brake beam, 16 cars being wrecked. A brakeman was injured.

10th, on Southern Pacific, at Strauss, N. M., a work train was derailed by a broken wheel, 2 laborers being killed and 15 injured.

12th, on Philadelphia & Reading, near Tabor Junction, Pa., freight train derailed by a fallen brake beam, one brakeman being killed.

14th, on Union Pacific, near Beatrice, Neb., a bridge repair train was derailed and wrecked by a broken wheel, 3 men being injured.

18th, on Rio Grande Southern, near Glencoe, Colo., passenger train derailed by the loosening of the cow catcher. The engineer and a man riding upon the engine were fatally injured and the fireman badly scalded.

20th, on Pennsylvania road, near Greensburg, Pa., the engine of a westbound freight train was derailed and fell over upon the eastbound track. An eastbound freight train ran into it a moment later and 18 loaded cars were wrecked, 400 hogs and two loads of cattle being killed. An Italian who was standing on the track watching the engine first derailed was run over and killed by the eastbound train. It is said that the first derailment was caused by a broken brake beam.

And 17 others on 12 roads, involving 2 passenger and 15 freight and other trains.

NEGLECTANCE IN OPERATING.

1st, 4 a. m., on Chicago, Milwaukee & St. Paul, near Isinours, Minn., a freight train descending a steep grade became uncontrollable and the train separated into three parts; 19 cars were derailed at the first curve and 3 others went some distance further. About 10 persons were in the caboose of the freight, and they were slightly injured.

5th, on New Jersey & New York, near Lodi, N. J., an engine which had been left unattended in a roundhouse was taken out about 1 a. m. by a party of drunken men and run some distance out upon the road. It was derailed at the junction of the Lodi branch and the main line.

22d, on Alabama Great Southern, near Carthage, Ala., a freight train was derailed at a point where track repairs were in progress, half a dozen cars being wrecked. A flagman was sent out and stopped the freight train, but between the place where he met it and the point of derailment there was another hand car, which the engineer took to be the obstruction for which he had been flagged.

25th, on Burlington & Missouri River, at Brush, Colo., a car in a switching freight train was badly damaged, presumably by careless switching, and a man who was "beating his way" in it was killed.

And 7 others on 7 roads, involving 5 passengers and 2 freight and other trains.

UNFORESEEN OBSTRUCTIONS.

4th, on Chesapeake & Ohio, near Lynchburg, Va., passenger train derailed by a stone which had fallen upon the track, the engineer and fireman being killed.

10th, on Illinois Central, near Jackson, Miss., passenger train derailed and most of the cars thrown over a 20-ft. embankment, badly injuring 3 trainmen and 2 passengers. It is said that the rails had been maliciously loosened.

12th, on New York, Ontario & Western, at State Bridge, N. Y., a snow plow pushed by three engines was derailed and wrecked, the foremost locomotive running part way through it. Five men in the plow were seriously injured.

20th, night, on Cincinnati, New Orleans & Texas Pacific, near Oakdale, Tenn., a freight train was derailed by a landslide, 10 cars being damaged and the engine overturned. Three trainmen slightly injured.

And 7 others on 6 roads, involving 2 passenger and 5 freight and other trains.

UNEXPLAINED.

4th, on Louisville & Nashville, near Louisa, Tenn., 2 cars of a freight train were derailed, injuring a brakeman.

4th, on Richmond & Danville, near Charlotte, N. C., several cars of a freight train derailed, injuring a brakeman.

12th, evening, on Pennsylvania, at Atglen, Pa., 2 cars of a freight train jumped the track and badly wrecked a dwelling house, injuring 2 persons therein.

20th, on Rio Grande Southern road, near Mancos, Colo., a baggage car in a passenger train was derailed and overturned, injuring 1 passenger who was riding in it.

22d, on Philadelphia & Reading, near Temple, Pa., several cars of a freight train derailed and a brakeman injured.

25th, on Newport & Sherman's Valley, near New Bloomfield, Pa., the engine of a passenger train was derailed and badly damaged. The engineer was injured.

30th, on Union Pacific, near Emory Gap, Colo., the engine and two forward cars of a passenger train were derailed and ditched, the engineer being seriously and the fireman slightly injured.

And 34 others on 27 roads, involving 4 passenger and 31 freight and other trains.

OTHER ACCIDENTS.

4th, on Pennsylvania road, at Jersey City, N. J., the tire of a driving wheel on the locomotive of a passenger train came off as the train was passing over the elevated road a short distance west of the station, a portion of the tire falling upon a wagon in the street below.

5th, 11 p. m., on Atchison, Topeka & Santa Fe, near Meriden, Kan., a smoking car in a passenger train was badly wrecked by the explosion of the steam heater in one end of the car, 5 passengers being injured, 2 of them badly. It is said that a defective safety valve was the cause of the explosion.

16th, 1 a. m., on Philadelphia & Reading, near Shamokin, Pa., freight engine No. 393 was wrecked by the explosion of its boiler, the engineer and fireman being fatally injured.

19th, on Boston & Albany, at Pittsfield, Mass., a parlor car in an express train was badly damaged by logs on a platform car in a passing freight train, a stake of the log car having become loosened. Two passengers were injured.

21st, on Delaware, Lackawanna & Western, near Richfield Springs, N. Y., the foremost engine of an express train drawn by two engines ran into a snow drift with such force that the cab was partially wrecked and the inside packed with snow, forcing the engineer against the back of the cab so violently that he was badly injured about the head and shoulders. He would have suffocated had he not been speedily extricated.

30th, evening, on New York, Lake Erie and Western, near New Portage, O., a car in a passenger train was set afire and totally destroyed by the explosion of illuminating gas, which had escaped in the closet of the car and was ignited by the lamp burning in that compartment. The conductor was considerably burned, but the train was stopped and the passengers all escaped.

And 6 others on 6 roads, involving 1 freight and 5 passenger trains.

A summary will be found on another page.

The History of the Equalizing Lever and the Development of the "American Type" of Locomotive.

CONCLUDED FROM PAGE 294.

In the spring of 1844 Messrs. Eastwick & Harrison having received a contract from the Russian government to build the engines and cars for the St. Petersburg & Moscow Railroad, then in process of construction, gave up their business of engine building in this country and, having formed with Thos. Winans the partnership of Harrison, Winans & Eastwick, established their works in Alexandrofsky, near St. Petersburg.

Shortly after Messrs. Eastwick & Harrison commenced to manufacture their eight-wheel engine a suit was brought against them by Mr. Campbell for infringement on his patent, in which he claimed the use of two pairs of coupled driving wheels in combination with a truck.

After brief litigation the case was compromised, and Eastwick & Harrison continued to build their engines as heretofore, and from this time on, until the expiration of the Eastwick patent in 1851, received a royalty on all engines constructed with the equalizing lever.

Mr. Ross Winans, Master Mechanic of the Baltimore & Ohio Railroad, and who afterward established a locomotive works in Baltimore, Md., was among the first to appreciate the value of the equalizing lever and to apply it to his engines, and he has since often erroneously been credited with its invention.

About the same time Wm. Norris, of Philadelphia, commenced to use it on the locomotives built by him, and within a short time afterward few engines, if any, were constructed in this country without employing an equalizing lever in some form. Mr. Rogers adopted it in 1845. Baldwin, having successively made use of gearing, a flexible beam truck and air springs, finally bought the patent right of Messrs. Eastwick & Harrison, and completed his first engine of this form in December, 1845.

In fig 6 is illustrated a passenger engine, built by Eastwick & Harrison in 1842 for the Baltimore & Ohio Railroad, and is a copy of a lithograph which appeared in the "Journal of the Franklin Institute" for January, 1843. In the same issue is published a letter from Capt. Charles Moering, of the Austrian Army, in which he comments thus favorably on the merits of this form of locomotive:

"It is but just to say, gentlemen, that you saved the eight-wheeled engine from becoming a mere notion, and that, owing to your exertions it has been brought to such a state of perfection as ought to make the old six-wheeler of the kind quite obsolete. It is, furthermore, but justice to state that your special adaptation of the lever or balancing beam, to the use of locomotives upon railways obviated the aforesaid difficulties in such a manner as to leave but little to desire; and here I regret to say that some of the northern railroads in Germany—notwithstanding the unqualified recommendation of so able an engineer as Mr. C. E. Detmold—have not adopted engines with your improvement."

"I consider the balancing beam, supported in its centre by a vertical shaft, resting on springs that are attached by the pedestals to the frame, and stayed on its ends by two vertical pins abutting against the two driving axles, as possessing, in an eminent degree, the two indispensable qualities—first, of equalizing the weight on both driving axles, in whatever condition the road may be, and, therefore, producing, in an eight-wheel engine of twelve tons, a constant and equal adhesion of eight tons, yet pressing the rails with but two tons; and, second, of furthermore diminishing the very ratio of impact as given above, the weight of the engine being suspended in the middle of the lever beam, causing it to fall only half the depth of any of the driving axles, in their passage over any short or sudden depression in the track, while the engines *A* and *B* must go down the whole depth, as supported by one axle alone, which, by increasing the height of fall, must add to the power of the percussion, and, therefore, ruin the road even in a shorter period than the proportionate number of twelve or nine years."

"But this is not alone what distinguishes your engines, the balancing beam of your arrangement being now used by nearly all the engine builders of note in the United States after having purchased the patent right from you, which at once bespeaks the great merit and usefulness of your improvement. It is, besides, the very simplicity of your engines that must engage the attention of even the least observing."

In the engines shown in figs. 5 and 6 are illustrated the first forms of the equalizing lever used on locomotives, but the construction here shown was changed in all engines afterward built. The form adopted by Eastwick & Harrison was an improvement on Mr. Eastwick's device, patented in 1833 by Mr. Jos. Harrison, Jr., the improvement consisting of a combination of springs in connection with the equalizing beam. Several designs were proposed by Mr. Harrison, some of which are shown in figs. 7 to 10.

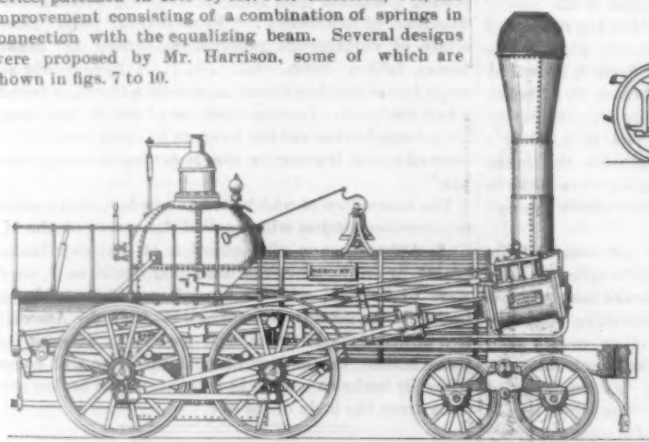


Fig. 6—The "Mercury," 1842.

A design similar to fig. 8 was used on the celebrated "Gowan & Marx," an engine which in its day attracted the attention of the whole railroad world by the great tractive power it developed compared with its weight. Its performance at the time excelled any record in this or any other country, and it was this engine which brought Messrs. Eastwick & Harrison into prominence, and procured for them from the Russian Government the contract for building the engines for the St. Petersburg & Moscow Railroad.

Since this engine was built, the construction of equalizing levers has undergone many changes to adapt them to the modern constructions of locomotives; first, for the eight-wheeled engines (American type), and

* *A* and *B* refer to six-wheel engines.

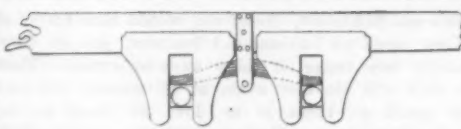


Fig. 7.

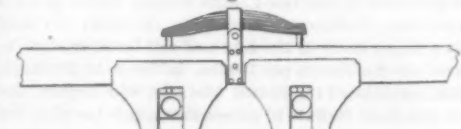


Fig. 8.

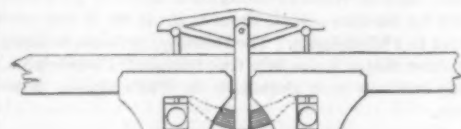


Fig. 9.

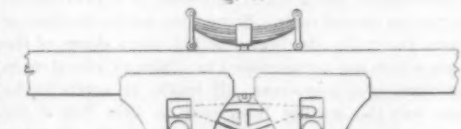


Fig. 10.

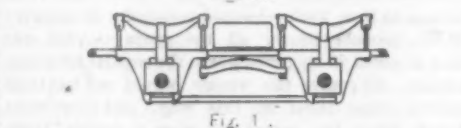


Fig. 11.

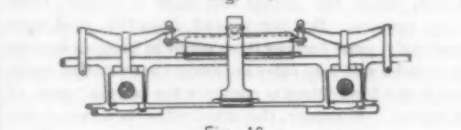


Fig. 12.

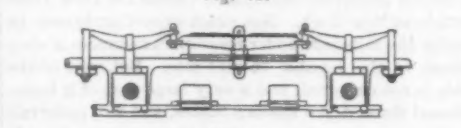


Fig. 13.

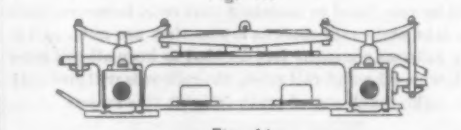


Fig. 14.

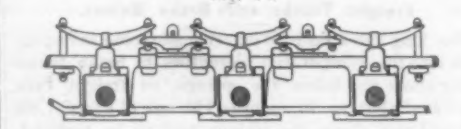


Fig. 15.



Fig. 16.

afterward for the more powerful engines having six, eight, ten and even twelve coupled driving wheels.

Figs. 11 to 14 show the forms of springs and equalizing lever arrangement that have been successively used for eight-wheel American engines by the Rogers Locomotive Works, and in fig. 15 is illustrated the manner of applying the same means of equalizing the loads

on the drivers, which has been adopted for consolidation engines by these and other locomotive builders.

Many other forms of the equalizing lever have from time to time been used, some of which are shown in figs. 16 to 19, but in all it is obvious, the action depends upon the same principle as that involved in the simple oscillating bar employed on the first engines built by Messrs. Eastwick & Harrison. Fig. 17 shows the design of equalizing lever, used on the Baldwin fast passenger engines in 1849.

In 1844 the Rogers Works, in an engine called the "Springfield," was the first to make use of an equalizing

beam between the driving wheels and the truck. Wm. S. Hudson and others afterward patented different forms of truck locomotives to which this method of equalizing the truck with the driving wheels was applied. The arrangement designed by Mr. Hudson is shown in fig. 19. The equalizing beam has also been applied to car trucks and otherwise employed in car and locomotive construction.

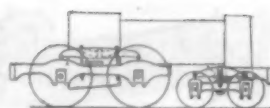


Fig. 18.

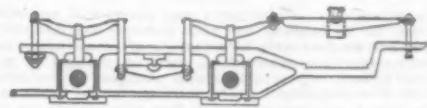


Fig. 19.

Both the equalizing lever and the swiveling truck of the locomotive were the result of the requirement of the early American railroads and the necessity for engines adapted to ready passage over sharp curves, imperfectly laid track and poor roadbeds. It has, however, been clearly shown that their advantage is not alone apparent under the then existing conditions, but also almost equally so on the most perfectly laid railroads of the present day; yet the adoption of these two distinctive features of the American engine in England and elsewhere throughout the world has not, until very recent years, made any marked progress. But it has been demonstrated beyond doubt that wherever the American form of locomotive has fairly come in competition with other types it has invariably proved its superiority in its ability to haul greater loads in proportion to the weight on the drivers; in less liability of becoming disordered and in incurring decreased cost of maintenance for weight hauled, and it is in all probability but a matter of a few years when its adoption will become universal.

TECHNICAL.

Hydraulic Foundations.

At the last meeting of the American Society of Civil Engineers, Mr. Robert L. Harris made the important announcement that, after over two years of thought and experiment, and over one year of devotion to the subject, he had conquered quicksand, and more than that, he could construct in quicksand, sands, and in many of the fine earth materials (largely of the material itself), floors, walls, monoliths, etc., of desired shape, at any reasonable depth below the surface and water level with but slight disturbance of the surface. These facts he had demonstrated, on a public work, at Providence, R. I.

He invited the members to inspect some quicksand, also a sample of the same, solidified below ground by his method, which at the middle of last month (March) was in its natural condition.

A New Form of Pyrometer.

Prof. W. C. Roberts Austen, in a recent report to the Alloys Research Committee of the British Institution of Mechanical Engineers, described a pyrometer invented by M. Le Chatelier which has proved to possess a very remarkable degree of accuracy up to temperatures of 1,800 degrees F. Its principle consists in the measurement of the electric current produced by heating a thermo junction inserted in a circuit with a galvanometer of considerable resistance. This thermo-couple consists of two wires, each about 0.02 in. diameter, one of which is of pure platinum, and the other of platinum alloyed with 10 per cent. of rhodium. The junction of the wires may simply be effected by twisting them together. This junction may be considered as a battery, for when it is heated a current of electricity is generated, no other source of electricity being employed. The free ends of the two wires are soldered to copper terminals, which are kept at a constant temperature by being plunged into test tubes filled with alcohol and immersed in water, the temperature of which can be observed with a thermometer. The thermo-couple measures the difference of temperature between its heated junction and the copper terminals. The indications of the galvanometer may be translated into corresponding heat temperatures by observing its deflections at the well known melting points of various metals.

The Baltimore Belt Railroad Tunnel.

The Baltimore Belt Railroad Co. has received an offer from the Thomson-Houston Electric Co. to thoroughly equip the tunnel for running trains through it by electricity without cost to the railroad company and to give the latter the free use of the plant for six months, provided that, if the experiment prove to be what the Thomson-Houston people claim, the railroad company shall take the plant at a price to be agreed upon.

Marking Air Brake Freight Cars.

The Atlantic Coast Line is fitting all its new freight cars with air brakes and marking them "Westinghouse Air Brake." About 20 cars a month are being built at the shops, all equipped with Westinghouse air brakes.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Mr. Roberts, the President of the Pennsylvania Railroad, is reported to have said that a fight between the all-rail and the lake-and-rail rates for carrying freight between the West and the East is bound to come, and that it looks as if the struggle has been begun. "The question is, can the all-rail lines transport freight as cheap as the lake-and-rail lines. To determine this a struggle will ensue, but I am led to believe that the all-rail routes will be victorious." This would seem to indicate that Mr. Roberts believes that the all-rail rate hereafter will be as low as the lake-and-rail rate. If so, this is important, for it means a permanent reduction of the through rail rates. The lake-and-rail rates certainly will not be advanced over those prevailing of late years, so to make them even the rail rates must be reduced. But this would seem to be more difficult now than a few years ago, when the bulk of the lake traffic came from or went to Lake Michigan ports, and chiefly to Chicago. Whatever advantage the lake vessels may have in this route, they suffer the great disadvantage of having to carry freight 950 miles between places only 525 miles apart by rail. Nevertheless, they seem to have thrived on rates between Chicago and Buffalo such as have never been made openly by rail. But there has now grown up a great traffic between Lake Superior ports and the East, and the distance between Buffalo and Duluth is not much greater by lake than by rail, and perhaps freight shipped by propeller from Duluth will, on the average, reach Buffalo quite as quickly as when shipped by rail—way stations not delaying the vessels much. If, now, the railroads propose to make rates to Duluth as low as by lake, they will have to make them extremely low—under present circumstances unprofitably low, we should say; and if they carry for nothing between New York and Duluth (which might not be a very serious matter), the interstate commerce law says that they must carry for nothing between New York and all places this side of Duluth, which would be a very serious matter indeed.

Very likely, however, Mr. Roberts intended to refer only to Lake Michigan shipments, and particularly to east-bound shipments. These form the great bulk of the lake traffic, and an overwhelming proportion of them consists of grain and flour, with some provisions. With the lake vessels, it is a matter of life or death to get this traffic. Without it they must tie up at their wharves. They will take this traffic at any rates which will enable them to earn their running expenses; though of course if rates should rule as low as that for a number of years, the fleet would not be renewed. As may be supposed from Mr. Roberts' position, the Pennsylvania Railroad carries but a small part of the lake-and-rail traffic. The lion's share of it goes by the lines east of Buffalo, and they have been in a manner forced into it by the necessity of competing with the Erie Canal. The lake-and-rail grain shipments are thus chiefly shipments to New York and Boston, and they with the canal give New York a larger proportion of the export grain business during the season of navigation than when the lakes are closed, Philadel-

phia and Baltimore, therefore, would fare better if there were no lake-and-rail business, just as they would fare better if there were no canal. That is, they will do best when at all seasons the rate on grain to them is as low at least as to any other place. Perhaps with the combination of the Reading and the Lehigh Valley, which gives a route from Buffalo to Philadelphia, the latter city may get a larger share of the lake-and-rail business; but to maintain the 2 cents per 100 lbs. in favor of Philadelphia, established for all-rail business, will require the rail line from Buffalo to accept that much less than for a shipment to New York, which probably costs nothing more, and offers the advantage of a chance to get a back load for the cars several times as great as if the cars went to Philadelphia. The Reading, perhaps, desiring to show that it is the only true friend of Philadelphia, may cultivate such shipments to Philadelphia, however.

A reduction of lake-and-rail rates is a common thing at this season, and is really a result of a previous reduction in all-rail rates. Some time before navigation opens, the railroads begin to bid for a share of the grain which has accumulated in Chicago elevators in anticipation of that event. If traffic is active at the time, only the weaker lines may do this, but if the stronger lines have many cars on side tracks, they too take part in the competition. This year for some weeks before the lakes opened, while the regular rate from Chicago to New York remained nominally 25 cents per 100 lbs., probably nearly all the grain carried was taken at about 20 cts., which was the regular lake-and-rail rate. Of course the vessels would not let their business escape them in this way, and they went enough below the actual rail rates to enable them to get cargoes. But the all-rail lines this year have apparently gone further than usual in bidding against the vessels, and lake rates are lower than usual so early, though not lower than is common for a great part of the season. Moreover, the canal rates open very low—4½ cents a bushel for wheat and 4 cents for corn from Buffalo to New York. Not much export grain can be had by the railroads under these circumstances if they adhere to the regular 25-cent rate. But most of the grain is not exported, and a very large part of it is distributed through the Eastern States, and will go by rail at a 25-cent rate, whatever the water rate may be. It will be very hard to maintain that rate, however, with the lake and canal rates as low as they are now, and if any railroad company has decided to keep all-rail rates as low as lake-and-rail rates, the railroads will probably not make much out of grain freights this season.

Freight Trucks and Brake Beams.

Not long ago a railroad officer made some investigation into the comparative casualties to brake beams hung above and below the springs, on freight cars. He found that in 10 months 120 out of every 1,000 beams hung above the springs had to be replaced. This is a terrible mortality indeed, being at the rate of 144 in 1,000 in a year. It may be that the method of hanging was faulty otherwise than in the point of suspension; but that that was the chief fault is shown by the mortality statistics of brake beams hung below the springs. Of these 12 in 1,000 were replaced in the same 10 months; or at the rate of 14.4 in 1,000 in a year. Except in the point of suspension the brake beams, rigging and method of hanging were alike in both cases, and the height of the beam above the rail with the cars empty was the same.

This investigation was made to get some definite notion as to what it was worth while to spend to get a good arrangement for hanging the brake beams below the springs. The fact that the casualties were ten times as great in one case as in the other went a good way toward settling the details of the truck adopted. The upshot was what an expert calls "as fine a job of brake hanging as I have ever seen." The wheel base is long—probably about six feet—and although the brake beams are inside-hung and hung below the springs they are well up toward the centre line of the wheels, and the parts are substantial and accessible. Additional room is gained by the use of metal brake beams.

We look upon this as a very good instance of the use of sense and scientific methods in an important detail of car design. Generally speaking freight car trucks are designed with no regard to the brakes, and it is impossible to hang brakes on them in a workmanlike way. They must be hung considerably below the centre line of the wheels, in a position disadvantageous for the action of the brakes; they are hung too low for entire safety and, with many arrangements the brake beam rigging, hung where the shocks are unrelieved by springs, rattles to pieces quickly. But these difficulties are not inherent in the principle of hanging brake

beams from the truck; they can be avoided by designing the truck with the fact in view that brakes are as necessary as wheels and axles, and making room for proper brake rigging.

The survival until now of the practice of treating a freight car truck as if it were to be used without a brake is only one evidence of the inefficient way in which freight cars are braked. The brake apparatus on the average freight car reminds one of the famous leg of mutton that was set before Dr. Johnson on one of his journeys, and which he said was "as bad as bad could be; ill-fed, ill-killed, ill-kept and ill-dressed." The brake equipment is ill-contrived, ill-made, ill-applied and ill-maintained. But the use of the air brake is sure to work a great and rapid change. One of the best jobs ever done by a committee of the Master Car Builders' Association was the report of the Committee on Standard Brake Gear for Air Brake Cars, presented at the Convention of 1889. The admirable investigation made by the committee and the recommendations and specifications all flowed from the introduction of air brakes into freight service. The influence of this report has been apparent in various ways and will be more widely felt as air brakes are more used on freight cars.

The committee discussed very briefly the arguments for and against both methods of hanging brake beams, but brief as the discussion is it covers the points quite fully, and those who are interested in the subject should read it, on page 115 of the Report of Proceedings, M. C. B. Association, 1889. The committee was of the opinion "that trucks should in future be constructed with proper allowances for attaching brake rigging, in which case all objections to the latter method [attaching them to the truck] would be disposed of."

One of the first arguments for hanging the brake beams below the springs is that the distance of the brake shoes from the wheels does not vary with the load, and that the centres of the brake shoes can be kept close below the centre line of the wheels, whatever the load in the car. With trucks having springs over the axle boxes, this advantage is sacrificed but there still remain very good reasons for hanging the brakes from the trucks. If the brake beams are hung from the car body, the relative position of shoes and wheels varies on curves, and the swaying of the car body may increase this variation. Thus the efficiency of the brakes is diminished, but what is worse, a real danger of derailment is introduced. When brakes are set the wheels are clamped to the car body and can no longer accommodate themselves to the change of line on entering and leaving curves or to sharp changes in surface. Moreover, as the outer wheels rise with the superelevation of track, and the centrifugal force tends to swing the car body toward the perpendicular, the outside wheels are nearer to the car body than the inside wheels. Now, supposing there are rigid hangers and the brakes are set, the result will be strains that are very apt to brake the hangers or the shoes. The following quotation from Mr. Pulaski Leeds is strong confirmation of this theory: "From several years' close study of derailments reported as caused by brake beams falling down, etc., . . . I have nearly always found the derailment at or near a curve, or found a bad low joint. In nine cases out of ten it has been a low joint-hung brakes and the hangers in every case . . . showed a new fracture or the fastening recently torn out."

The committee of which we have spoken above made no recommendation which called for a vote of the M. C. B. Association on this question of hanging brake beams, or on the matter of designing trucks as if they were to be used with brakes. It would probably be impossible to get any definite action from the Association on these matters now, and useless to attempt to force action; but it may be that the time will come when air brake cars will be refused if the brakes are hung from the body of the car.

Grain Transportation in Russia.

I.

Mr. Ernest Pontzen, who, with the late Mr. Lavoigne prepared the great French work on American railroads, has investigated the subject of grain transportation in Russia, and I report on the subject, which is dated Nov. 12, 1890, is published in the *Annales des Ponts et Chaussées* of last November. The subject is more interesting to us, probably, than to any other people save the Russians themselves, since Russia is our chief competitor in supplying grain to Western Europe, and could, perhaps, with a transportation system approximately as extensive and effective as ours, supply the whole European demand for wheat, rye and oats. As for Indian corn, it and all Europe together produce but a small fraction of our average

crop. Mr. Pontzen finds that Russia provides 35.5 per cent. of the total grain imports of the rest of Europe, the United States 33.1 per cent., Rumania 8½ per cent., India 7½, and no other country as much as 5 per cent. For what period these percentages were found is not stated in his report: but other statistics immediately before and after this statement are for the five years from 1888 to 1892. The Russian grain exports vary greatly with the crops, as by far the larger part of the production is consumed at home; but taking successive five-year periods since 1866 they have increased constantly and largely, the average grain exports per year in each of these periods having been in tons:

1867-71.	1872-76.	1877-81.	1882-86.	1887-89.
2,003,200	3,003,300	5,091,200	5,628,300	8,057,500

This shows the exports to have trebled since 1870, and to have increased nearly three-fifths since 1886; and this has been with a very small increase in railroad mileage. The exports for the last period (which is only three years) were equivalent to 268 millions of grain as heavy as wheat.

For some years the Russian Government has given special attention to the grain trade. It is the one great export of the country, whose prosperity largely depends, under present conditions, on the profitability of this export, which itself depends chiefly on the cost of delivering the grain from the farms to the European markets. The aim of the government has thus been to facilitate and cheapen everything connected with the transportation, storage and sale of grain, and in order to act intelligently it has collected a great body of statistics as to the production and consumption, as well as the transportation and exportation of grain in the empire.

These statistics indicate an average consumption of grain equal to 487 lbs. per inhabitant from 1883 to 1889, and that apparently the consumption does not vary much, having been 474 lbs. per inhabitant from 1870 to 1880. We should remember, however, that it is simply impossible to ascertain these figures exactly. The consumption of animals as well as men on the farms must be estimated, and this is by far the larger part of the production. But on this basis the grain exports were 14.7 per cent. of the consumption from 1870 to 1879, and 25.5 per cent. from 1883 to 1889, which would make the production of late years as much as 32,000,000 tons, or say 1,200,000,000 bushels, which is about one-third of the production of this country last year. The area cultivated in grain in Russia does not seem to vary greatly from year to year; and as it is an old country, with an agricultural population much denser than that of this country, there is not there the same opportunity for growth as here.

Wheat forms the largest item in the Russian grain exports, being 38.4 per cent. of the total grain tonnage exported from 1887 to 1889 (averaging 103 million bushels per year). Nearly three-fourths of the wheat exports are made from the southern frontier—that is, from ports on the Black Sea and the sea of Azof, which is substantially a bay of the Black Sea. A little more than half of the other grain exports leave by the western frontier; that is, by Baltic ports and the railroads to Germany and Austria—chiefly to Germany. This is because the wheat is produced chiefly in the south, while there is a market for rye in Germany not found elsewhere in Europe except Russia itself. The Scandinavian countries, it is true, make a large part of their bread of rye, but their population is too small to require large imports, and they are very cheaply supplied from the Black Sea ports. From 1885 to 1888 53 per cent. of the total Russian grain exports went from ports on the Black Sea and the Sea of Azof, 28 per cent. from Baltic ports, 8 per cent. by rail into Germany, and 1½ per cent. by rail into Austria. Odessa exports much more than any other port and 22.6 per cent. of the whole, and then follow St. Petersburg with 12.6 per cent. and Rostov (a port on the Sea of Azof) with 9.9 per cent.

The chief markets for Russian grain are Germany, which took 25.3 per cent. of the whole from 1883 to 1887, and Great Britain, which took 23.75 per cent., and little Holland, which received 12½ per cent.

Russia does not produce half as much wheat as this country, and a fifth less oats, but twice as much barley and 30 times as much rye. The competition of this country is felt there more than that of any other, and our grain production and methods of marketing are carefully watched. Rumania and Hungary would be still more formidable competitors, owing to their nearness to the consuming markets, but for their limited extent. The Russian grain is much nearer the sea than the larger part of our grain exporting states, and the distance by sea to the European markets is shorter, but the freights by sea are by no means lower in proportion. Some of the chief Baltic ports are closed by ice appar-

ently about as long as our lake ports; the Sea of Azof is also closed much of the time, and even Odessa has its shipments limited in winter. We have but a single quotation for ocean freights, which, of course, must vary with circumstances. In April, 1890, they were at the rate of 7½ cents per bushel from Odessa or Sebastopol to Marseilles, which is about halfway to Liverpool.

The poverty of the Russian grain grower has been one of his chief disabilities in competing with other countries. Apparently he has very little granary room at home, and is so pressed by debts that he must get money for his grain as soon as possible after threshing. Therefore everyone hurries his grain to the railroad station, the canal or river landing, where it arrives after harvest much faster than it can be carried away. But at those places there was rarely any provision for storage other than sheds or open platforms, on which the sacks of grain were stacked, protected from the weather only by tarpaulins, until it could be carried away—months later in many cases. This placed the producer, who must have money, at the mercy of the local dealer, or some such purchaser, who could wait. If the shipper succeeded in getting his grain forwarded early, he found more competition among buyers at the ports or other great markets, but he was still forced to sell with little delay. Thus the government considered it desirable, first, that good and sufficient storage be provided at the farmer's stations, so that the shipments might be made more deliberately, and the grain kept in good condition; then, that the producers should be able to borrow money on grain in store to meet their immediate necessities, and not be forced to sell at once; further, that they should have accurate knowledge of the state of the great markets.

To encourage the construction of elevators the government authorized the railroads to collect about 0.2 cent. per 100 lbs. on all grain to cover their cost. Elevators were also needed at the ports, where, in spite of investigations made in this country 15 years ago or more, and reports on the great advantage of elevators, until very recently, universally the grain was stored in sheds and comparatively small granaries, usually at some distance from the wharves, so that a great force of men was required to carry the sacks from cars to storehouse, and from storehouse to vessel. Recently, at Odessa, modern elevators, with a capacity of about a million bushels, have been completed, but they are about four miles from the harbor! They are connected with the wharves by tracks running on trestle work, and the cars which carry from the elevators are hopper cars, from which the grain runs down into the vessels.

To protect the producer from the necessity of selling his grain at once, the government authorized the government bank to make advances on grain in elevators if it has been cleaned, weighed and graded when received, up to two-thirds of its value, on which advances 7 per cent. interest is charged. Other banks and private capitalists have followed the example of the government bank.

The farmer, thus being able to hold his grain, becomes virtually a speculator, and needs to know when he can sell to advantage. Here, again, the government steps in and does the work performed in other countries by the press: it posts up market reports, giving the prices of each kind of grain at all the principal Russian and foreign grain markets (not omitting Chicago and New York), the gold value of the paper rouble, freights and insurance on grain from Russian ports and from New York to the principal ports of Western Europe. Bulletins are posted also giving estimates of production of growing crops in different districts of Russia. It is said that the spirit of speculation, under these circumstances, has in some cases got the better of the Russian farmer, and instances are cited where he has held his grain until interest on advances, storage charges, and perhaps a fall in prices, have exhausted his margin over advances, precisely as if he had been an ungodly speculator in Chicago.

Even with facilities for storing at the interior stations (only a beginning of which has been made so far) many prefer to hold their wheat at the ports, because there they can better take advantage of a temporary rise in prices. To facilitate this, the agents of the railroads or those of the storehouses will act as selling agents. They have done this since 1883 at Odessa, long before there were elevators there.

In ordinary times it costs about 8 cents per ton to unload grain and put it in store, and about 6 cents more to weigh it. Taking it out of store and loading it on vehicles, with another weighing, costs a trifle more. Storage and shoveling for ventilation cost 23 to 27 cents per ton. The cost with elevators is but little less, but the grain is cleaned better, classes higher

and keeps better. At the Odessa elevators (four miles from the port) the charge for elevating in, storage for five months, elevating out and transfer to vessel, and commissions for sale amount to about 13 cents per 100 lbs., equal to 8 cents per bushel for wheat. The Odessa elevators cost to build about \$90 for every 1,000 bushels capacity, and their charges have been regulated with the expectation that they will pay for themselves in 10 years, besides interest.

At none of the Russian ports, except one new one, do the elevators or grain warehouse stand directly on the water's edge where the vessel may lie alongside to take cargo. The Azof ports cannot always be entered by large vessels, and they cannot get into that sea from the Black Sea unless the channel between the two seas is dredged yearly. At Taganrog, on the Don a few miles above the Sea of Azof, it is often necessary to use lighters, which add something like one cent per bushel to the cost of transfer. When there is a great pressure of grain for shipment, as often occurs in the fall, laborers' wages and the hire of lighters go up so that it sometimes costs five times as much as this. The men who handle the sacks of grain usually get 75 to 95 cents a day, but when there is a great demand for them they sometimes are paid \$2.90 to \$3.50. When grain is transferred in sacks on men's shoulders from the cars to the vessels, the cost, including weighing, is rarely less than 1½ cents per bushel, and may be twice as much, even without any considerable rise in wages. Storage-houses on railroad tracks rent for about 2 cents per year per bushel of capacity. The railroads charge 83 cents for switching a car to the storehouse, and \$1.66 per day for holding a car after the time allowed for unloading.

The most convenient Black Sea port seems to be the new one called Novorossisk, near the eastern end north of the Caucasus, and not very far east from the entrance of the Sea of Azof. Its grain trade dates from the opening of the Vladikaukaz Railroad, which extends thence eastward among the foot hills parallel with the Caucasus. Novorossisk is the only port which is never closed by ice, but it is exposed to a wind which prevails there from 20 to 24 days of the year, though harbor improvements now in progress are intended to shelter it from this. Here elevators are placed close to the docks.

At Odessa the tracks are on a trestle work generally about 150 ft. from the water's edge, on the principal quay, and 16 to 20 ft. above it. The hopper cars containing grain in bulk discharge their contents on an endless canvas belt about 27 in. wide, which is carried on rollers of iron such that the canvas forms a trough in which the grain is carried into the vessel. There are four such grain carriers, each driven by a steam engine, which not only drives the belt, but moves the whole apparatus on a track laid for it between the foot of the trestle and the edge of the quay. The carriers are not often moved, however. When one car has been discharged another takes its place. It requires but four or five minutes to unload a carload of nine to 11 tons of grain. Near the end of the quay the trestle approaches so near to the edge that the grain is conducted by gravity in simple plate-iron troughs from the car to the vessel.

The subject of Russian rates for grain transportation will be presented in another article.

Standard Tests for Vertical Plane Couplers.

The Committee of the Master Car Builders' Association held an open meeting at Pittsburgh last Tuesday, at which all of the manufacturers and others interested in the coupler question were invited to be present. The meeting lasted four hours. In the absence of Chairman Lentz Mr. G. W. Rhodes acted as Chairman. Mr. J. N. Wallis, the third member of the committee, assisted Mr. Rhodes. A large number of manufacturers and agents of coupler companies were present as well as several railroad men. The result of the meeting was a recommendation by a majority of the coupler men present to change the proposed standard tests, as given in the *Railroad Gazette* last week, in the following particulars:

Paragraph 1.—Recommended to remain as first proposed. Par. 2.—To remain as before, with the addition of a clause stating that the committee will furnish a drawing of the masonry foundation. Par. 3.—Pulling tests to be increased to 125,000 lbs. Paragraphs 4 and 5.—To remain as before.

The coupler men requested the committee to propose a test for the guard arm of couplers and a test for the bending of the coupler and knuckles, in addition to the tests for breakage under a drop. Altogether the meeting was a very satisfactory one to the committee, as it resulted in an approval of the work already done.

The proposed changes will be gratifying to those coupler makers who can meet the severer tests, though

they may produce an opposite feeling among those who are selling weak couplers, and who are the real cause of the present investigation. It is safe to assume that if all the couplers that have been put in service during the past three years had been equal to the tests now proposed, we should have heard little about standard tests. As things now are, careful inspection is the only means by which a railroad company can protect itself from considerable loss in buying vertical plane couplers. It is not so much the loss of the couplers due to breakage that the railroad companies have to suffer from, as the damage from wrecks caused by failures of couplings and annoying delays to trains. Close inspection and severe tests will do more, just now, for the M. C. B. coupler than almost anything else. Only in this way can inferior and dangerous couplers be kept out of service.

The tests as proposed are not too severe. Coupler heads are made and have been made for the past two years of malleable iron with cast steel knuckles that will meet the proposed tests even with the increased requirement for pulling (135,000 lbs.) Some malleable couplers will stand 20 per cent. more than the proposed tests. About all of the couplers now made, except a few that have bad locks, will stand, when made of good steel, considerably more than the tests proposed. As it is not a hardship for the malleable iron makers to do what has been done for two years past and as not too much is asked of the steel makers, it is almost an axiomatic conclusion that the proposed tests are fair to all. Of course such tests as these will increase the cost of couplers, as better material must be used and more of it. And more care must be taken in the manufacture to keep the product uniform.

Those present at the meeting seemed undecided about the tests of strength of guard arms, as being a matter about which little is known, except that the arms do break. A recent set of statistics covering a large number of couplers shows the guard arm breakages to be 58 per cent. of all the breakages to the heads. So few tests have been made of guard arms that it is not clear just what is a proper requirement that will be easy for the manufacturer to meet, but we do know that the blow that a guard arm gets in service is not very much, if at all, less than that received by the knuckle. The severest blow received by a guard arm is that when a coupling is made with another vertical plane coupler. Then the heel of the opposing coupler strikes the guard arm a violent lateral blow as it drives in to a coupled position. It may be, therefore, that the only just and fair way to test a guard arm is by striking it a blow of the same kind that it receives in service. This can be done by using a drop with its lower side shaped like a knuckle. Quite likely the best way to test couplers after all, will be to abandon the proposed unnatural square-faced drop and select a shape of drop that corresponds more nearly with service conditions. And more especially is this reasonable, as the tests are generally to be performed at the shops of the manufacturers, and new drops will have to be made for the purpose. As they will not be used for axles, they can be designed especially for couplers.

The discussion about gauges brought out the unfortunate condition of things resulting from the delay in making the standard gauges. A motion was made that the manufacturers of couplers approve of the limits of variation already adopted, but it was necessarily laid upon the table, as no one present had ever seen a standard gauge or knew what was the real meaning of the variation allowed. There seemed to be a general feeling that too little allowance had been agreed upon to permit the manufacture of couplers at a reasonable price.

Altogether the results of the meeting were valuable. There is now a thorough understanding between the respective parties about the intentions of the committee and the present and prospective powers of the manufacturers to meet the requirements that the committee intends to make.

Standard Tests for Air Brakes.

The Master Car Builders' committee on the "Efficiency of Air Brakes" held an open meeting in the Grand Pacific Hotel at Chicago April 22. Several brake companies were represented, and the discussion of the tests proposed by the committee (given in the *Railroad Gazette* of April 1) was long and, in some cases, a little excited. Only one company objected to the general plan of the tests as being too severe, although several objected on the ground that a better brake would be developed if the rigid requirements in respect to quick action were relaxed. In general, the sense of the meeting and the results of the discussion were:

(a) To establish uniform conditions of 70 lbs. pressure in train pipe; 4 in., 6 in. and 12 in. piston travel, and actual conditions in the matter of equipment of a 50-car testing rack.

(b) To require that all new triple valves fit the Westinghouse template.

(c) To require that the brakes commence to apply on the last car of a 50-ft. car train in three seconds, and to have 55 lbs. pressure in cylinder on last car in 3½ seconds from the movement of the engineer's handle in the cab.

(d) The quick action must pass to the rear of the train when three cars are cut out.

(e) To emphasize the need of the release tests as they have been made recently. This point was well aired, and the test favored by most of those present is much more difficult to meet than the tests against which so much objection was made on the Lehigh Valley and at Burlington recently.

(f) To emphasize the possible errors in road tests that render them incomparable with others and to more clearly show the value of rack tests to determine the comparative merits of the individual features of triple valves. Yet, to prevent all possibility of erroneous conclusions from a rack test alone, a road test and a long service endurance test were recommended.

(g) The need of a test for the delicacy of the emergency feature and the rate of charging was pointed out and the committee added such tests to its recommendations.

The foregoing gives, in a general way, the tenor of the discussion at that meeting.

In another column will be found the revised proposed tests as prepared by the committee since the meeting. These tests have now all been made by the committee, in a body, on a testing rack of 50 and 100 cars and have been found to be practicable. The trial of the proposed tests was made at the Wilmerding shops of the Westinghouse Air Brake Company on Wednesday of this week. The full rack of 100 brakes was placed at the disposal of the committee. The result of the trials showed clearly that the tests proposed were not too severe for a new brake to meet if properly designed and carefully built. The Westinghouse brake applied on the fiftieth car in 2½ seconds, and was fully on in 2½ seconds by a stop watch. It applied on 100 cars in 4½ seconds by a stop watch. The electric recorder shows about .3 second less time. In the release tests 40 brakes of the 50 were released through a ½-in. hole. The last four were finally released by admitting a small excess of pressure in the pipe, so they were not "stuck on" in the strict sense of the term. The revised tests will now again be considered by the committee and again published before the conventions in June.

March Accidents.

Our record of train accidents in March, given in this number, includes 75 collisions, 107 derailments and 12 other accidents, a total of 194 accidents, in which 40 persons were killed and 193 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	But- Crossing ting, and other.	Tot'l.
Trains breaking in two.....	4	1	5
Misplaced switch.....	3	1	4
Failure to give or observe signal.....	6	2	8
Mistake in giving or understand- ing orders.....	0	5	5
Miscellaneous.....	10	5	15
Unexplained.....	18	6	24
Total.....	41	16	57
DERAILMENTS:			
Broken rail.....	11		11
Loose or spread rail.....	5		5
Broken bridge.....	1		1
Defective frog.....	1		1
Broken wheel.....	5		5
Broken axle.....	9		9
Broken truck.....	3		3
Fallen brakebeam.....	5		5
Loose cowcatcher.....	1		1
Broken drawbar.....	1		1
Broken car.....	2		2
Misplaced switch.....		7	7
Careless running.....		2	2
Track repairs.....		1	1
Failure of conductor to report damaged track.....		1	1
Landslide.....		4	4
Snow.....		2	2
Washout.....		1	1
Malicious obstruction.....		1	1
Accidental obstruction.....		1	1
Unexplained.....		41	41
Total.....		57	107
OTHER ACCIDENTS:			
Boiler explosion.....		1	1
Broken side rod.....		1	1
Cars burned while running.....		3	3
Heater explosion.....		1	1
Gas explosion.....		1	1
Various breakages of rolling stock.....		1	1
Other causes.....		4	4
Total.....		12	12
Total number of accidents.....			194

A general classification shows:

	Col- lisions.	Derail- ments.	Other acc'd'ts.	Total.	P.c.
Defects of road.....	18	18	18	54	27.8
Defects of equipment.....	5	26	5	36	18.5
Negligence in operating.....	38	11	3	52	26.8
Unforeseen obstructions.....	11	4	15	30	15.4
Unexplained.....	—	—	—	75	38.3
Total.....	75	107	12	194	100

The number of trains involved is as follows:

	Col- lisions.	Derail- ments.	Other acc'd'ts.	Total.
Passenger.....	35	28	10	73
Freight and other.....	101	79	2	182
Total.....	136	107	12	255

The casualties may be divided as follows:

	Col- lisions.	Derail- ments.	Other accidents.	Total.
KILLED:				
Employes.....	20	9	2	31
Passengers.....	1	—	—	1
Others.....	—	—	—	—
Total.....	21	9	2	32

INJURED:				
Employes.....	37	55	1	93
Passengers.....	34	64	7	105
Others.....	3	2	—	5
Total.....	74	121	8	203

The casualties to passengers and employes, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	—	—	1	10
Defects of equipment.....	—	23	8	23
Negligence in operating.....	1	29	26	42
Unforeseen obstructions and maliciousness.....	—	4	2	12
Unexplained.....	—	1	—	6
Total.....	1	35	37	93

Twenty four accidents caused the death of one or more persons each, and 43 caused injury but not death, leaving 12 (63 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with March of the previous five years shows:

	1892.	1891.	1890.	1889.	1888.	1887.
Collisions.....	75	74	67	38	65	45
Derailments.....	107	128	98	59	90	59
Other accidents.....	12	10	11	4	8	19
Total.....	194	212	176	101	172	117
Employes killed.....	37	35	35	19	35	32
Others.....	3	2	9	3	23	27
Employes injured.....	93	95	95	54	105	144
Others.....	1-6	95	70	50	105	144
Passenger trains involved.....	66	81	49	33	75	46

Average per day:

Accidents.....	6.74	6.84	5.32	3.38	5.55	3.77
Killed.....	1.39	1.42	1.42	0.71	2.74	1.94
Injured.....	6.22	6.16	5.32	3.35	6.79	6.84

Average per accident:

Killed.....	0.206	0.209	0.257	0.217	0.500	0.504
Injured.....	0.995	0.991	0.965	0.929	0.227	1.812

We have record of only one passenger killed in the month of March. This was in a collision at Fairmount, W. Va., on the 21st. This collision happened on a road where the standards of safety both in appliances and methods of operation would seem, from the newspaper accounts, to be far below the average, not to mention a high standard. Several other train accidents caused injuries to persons which were expected to prove fatal, but we have seen no account of the death of any of the injured persons.

The worst accident of the month was that at Milwaukee on the 1st, where seven men were killed by a comparatively slight collision. The cause was a misplaced switch, and the ultimate remedy is, of course, interlocked signals. It does not appear, however, that the passenger train was running rapidly (it was in a yard), and it is possible that there was serious negligence on the part of the engineer. As the state of Wisconsin publishes no intelligent reports of accidents, the true cause is not likely to be widely known.

The other accidents to passenger trains of a serious nature were those at Meriden, Kan., on the 5th; New Portage, O., on the 30th; Dale, Wis., on the 14th, and at Odin, Ill., on the 22d. Two of these are classed among "Other Accidents," and that class has quite a variety of serious mishaps this month. The accidents at Dale and Odin were of just the right kind to furnish big "railroad horrors," but seem to have escaped that notoriety by fortunate combinations of circumstances.

A "dummy train" was derailed near Mobile, Ala., on the 22d, and the engine was overturned. Near South Bend, Ill., on the 11th, an electric street car ran into a Chicago & Grand Trunk freight train, and the conductor of the car was badly hurt.

In January eight passengers were killed in train accidents, but in February there were but two, and in April thus far there has been none killed, so that the American who, from past experience has come to feel prepared at any time for startling accidents, has now had a breathing spell of about three months, for which, no doubt, he feels profoundly grateful.

The Pennsylvania Company's line from Chicago to Cincinnati and Louisville is about as likely to be sold to the Stickney road, as it is to be presented gratis to the King of Dahomey; and Mr. Stickney's road (the Chicago, St. Paul & Kansas City) needs a connection with the Richmond Terminal system about as much as the Brighton & Saco River needs a connection with the Pecos Valley; and yet a Chicago correspondent writes, and the most dignified daily newspaper in New York prints, such a dispatch as the following:

Chicago, April 26 (Special).—The Journal has this: A story was started in this city to-day linking A. B. Stickney's Chicago-Great Western corporation with the Pennsylvania Railroad in a deal which, if completed, will put Mr. Stickney in possession of the latter's Chicago & Ohio River line. An official suggested that it might be necessary for the Great Western to get connection with the Richmond Terminal system sometime in the near future, and thought no better scheme could be devised than to purchase the Pennsylvania line, if it could be had at what it is worth.

The telegraph companies have a rule prohibiting idle conversation by the operators on the wires, but their dynamos would certainly be put to much better use than they are if this rule were suspended sufficiently to crowd out dispatches of this kind. Telegraph operators who discuss base-ball, or gamble, or make love to the girls at the way offices, get some benefit for the time spent, but this Chicago sawdust is not only useless, but annoys a great many unoffending people. The above quoted item is a sample of a kind of stuff that appears quite often. Readers have come to accept from 50 to 95 per cent. of fiction as inevitable in many

classes of press dispatches, and are in a measure resigned; but items that are 100 per cent. nonsense ought to be put in the nonsense column. Moreover, jokes ought to be funny.

The paper on aluminum which appears on another page gives a good summary of the present state of the art of extracting and using this metal, with an estimate of the possible diminution of the cost of production. The paper has an especial value, in that it is by a man to whom it is a matter of dollars and cents to hold and propagate correct notions concerning aluminum. It is, therefore, eminently practical. Mr. Hunt has done a great service in putting his time and money into the production of aluminum in commercial quantities, but he has done almost as great a service in setting people right as to its possible uses. A good while ago he had the sagacity to discover many of the physical limits to the use of aluminum and to see that his interests as a manufacturer would suffer in the long run by the spread of false notions of its value in the arts. He has, therefore, endeavored in his papers and lectures to tell the public just what those limits are and what its probable value really is, so far as one can now see. His candor in former papers has surprised some people. It is about a year and a half ago that we pointed out that section for section aluminum is a very weak metal as compared with steel; and that pound for pound it is no stronger. Thus, aluminum tension members would be as heavy as those of steel and three times as big, and the proportions of compression members would be even worse. But there are still greater objections to the use of aluminum in bolted and riveted structures. With its low resistance to compression and high ductility it would be found impossible to use it where bolt or rivet holes are subjected to severe alternating strains. But the thousand possible and probable uses of aluminum are pointed out or suggested in Major Hunt's paper. The wide use of the pure metal is only a question of price, and in alloys it will almost certainly be one of the most valuable of the metals.

If you have good company and can bribe the guard to keep out everyone not belonging to your own party, a first-class compartment in an English "railway carriage" is a very agreeable and, indeed, luxurious place for a day's journey. The seats are comfortable and excellently upholstered, the privacy is pleasant, and it is often a comfort to be relieved from the coming and going of the restless spirits who wander up and down in an American train. But under most circumstances the privacy of an English compartment is really only imaginary. If you are obliged to share it with strangers, as you generally must, the publicity is actually greater than in the open American car. That is, you are under a direct and unmitigated scrutiny that is hardly possible in an American car. If the compartment is full the juxtaposition of your fellow-travelers is close and probably offensive; if there is but one other occupant you are not at all sure of escaping an adventure before you come to your journey's end. Crimes against the person which are impossible in American cars are not very uncommon in English carriages. Within a few months several cases of attempts to outrage women have been reported. The latest one reported involves a gentleman of high social and official position. It may be an attempt at blackmail, but this makes the matter little better. It is bad enough for a man to be exposed to assaults upon his reputation by adventuresses. If English passengers are not protected every man will have to travel with his chaperone and every woman with a body guard. We do not quite see how Mr. Jeffers can torture these facts into an argument for "tube frame" cars and bogie trucks, but makers of American passenger cars may find some comfort in them.

Mayor Grant, of New York City, this week appointed the commissioners to supervise the raising of the tracks and the approaches to the New York Central draw bridge over the Harlem River at 135th street. They are George W. Birdsall, Walter Katte, Charles W. Dayton, Joseph H. Haslin and John Fox. The first two are engineers, Mr. Birdsall being practically a representative of the city and Mr. Katte of the railroad company, of which he is Chief Engineer. Mr. Dayton is a lawyer, and was the representative of the property owners of Harlem in the proceedings before the legislature. Mr. Fox is an ex-State Senator and Mr. Haslin is a dry goods merchant. The fact that New York State has finally passed a law, consistent with the United States law regarding the height of this drawbridge, so that this important improvement can be at once begun, has already been published in these columns. The general plan for rebuilding the railroad was outlined in the *Railroad Gazette* of April 8, page 268. The drawbridge will have four tracks, and its centre is to be at the same point as that occupied by the centre of the present draw. A temporary bridge will be built on the west side of the present location, for use during the construction of the new bridge. The elevated structure for the tracks north of the bridge will probably be an earth embankment with retaining walls, as the right of way here is not a street but is owned by the railroad company. The brick station at 138th street (Mott Haven) will be left at the present level, but will have to be moved back (only platforms

being provided on the level of the tracks) to make room for the third and fourth tracks.

The extent to which the Chicago, Burlington & Quincy has been improving its equipment during the last few years (and without excessive expenditures) is very creditable to the management. The old, light locomotives have been replaced by the heavy, six-coupled, class "H" moguls and ten-wheel engines. The new "Class I" is probably the most successful suburban locomotive in this country. This engine was illustrated in the *Railroad Gazette* of Dec. 13, 1889, and the simplicity of its design attracted considerable attention at that time. The improvements in freight and passenger cars have been equal to those in the locomotive department. We have heretofore referred to the change in the height of the floors of the cars, which gives them greater interior capacity without increasing the height over all, makes them more convenient to load and unload, and gives considerable additional strength in the draw bar connections. All cars recently built have metal brake beams, vertical plane couplers, channel bar trucks and other well tested improvements. The car builders say that the specifications for these cars are the most complete they have ever received, and the manner in which the requirements are presented enables them to bid with a clear knowledge of what is wanted. In addition to the progress in new construction, there is constant improvement of the old equipment. Within about two months 1,650 sets of Westinghouse air brakes have been placed on old cars and a large number of vertical plane couplers have been put in service.

Superintendent Pitcairn, of the Pittsburgh Division of the Pennsylvania road, in a speech at the Young Men's Christian Association in that city last Monday, expressed himself as strongly opposed to the running of trains on Sunday; whereas the newspapers seem to be greatly astonished, the item giving this information being capped with a bold headline in a good many papers. One Pittsburgh paper, referring to a concerted attempt now being made in that city to stop the running of trains and street cars on Sunday, regards Mr. Pitcairn's utterance as indicative of "a great victory." But these news editors overlook the fact that one superintendent, however well disposed and powerful, can do comparatively nothing in this matter. More than this, a whole board of directors, if it be only one board, is practically powerless in most cases. Railroad men like to rest one day in seven, as well as people in other business. Their ranks contain the usual proportion of men who would be glad to work 168 hours a week, if they could, for the sake of the increased pay, but these do not control the road. The Pennsylvania and the New York Central made some sort of an attempt to stop Sunday freight traffic about three years ago, but their good resolutions have gone where a good many other good resolutions go, because competing lines, which must fight hard for traffic or starve to death, carry freight on Sunday, thus placing at a disadvantage any shipment started on Sunday over a Vanderbilt or a Pennsylvania line. The poorer roads, struggling for traffic, take every lawful means to get it; and it is as difficult to frame an effective law to stop Sunday freight traffic as it is to induce the poorer roads to stop it voluntarily.

The House Committee on Commerce has agreed upon and reported a bill modifying the Interstate Commerce law as desired by the Interstate Commerce Commission. The principal changes made in the existing law by the bill are summarized by a press dispatch as follows: It makes the tariffs, schedules and reports, which under the law must be furnished the Interstate Commerce Commission, records in the legal sense, so that copies of them, certified by the Commission, may be used as evidence. It makes the corporation, which is a common carrier, itself indictable and punishable by fine for all offenses. It strikes out the provisions in the law by which penalties for violations apply to shippers as well as to the carrier. This is so as to make it possible to use them as witnesses. It makes the testimony of witnesses taken by the Commission, after due notice to all parties and an opportunity given for cross-examination, final in that case, so that the matter will not be reheard by the courts, but the testimony taken by the Commission will be considered the same as though taken before a Master in Chancery. It preserves all the rights to trial by jury as guaranteed by the Constitution, but gives precedence both in the trial and appellate courts to interstate commerce cases over all civil business.

NEW PUBLICATIONS.

Economies in Maintenance of Way, by Benjamin Reece. This paper, which was read before the New York Railroad Club March 17, and published in the *Railroad Gazette* of March 25, has been reprinted by the Q & C Co., of Chicago, and issued in pamphlet form, apparently for gratuitous distribution. The type is large and clear, and a wide margin is utilized for a number of helpful and convenient sideheads, some of which are found on nearly every page.

TRADE CATALOGUES.

Portland Cement Industry.—The latest catalogue of the American Cement Co., of Philadelphia, is entitled, "History of the Portland Cement Industry in the

United States." The catalogue is printed on fine paper and consists largely of handsome direct-process cuts of buildings and bridges in which this company's cement has been used. There is a large number of these, embracing every variety of masonry structure. The catalogue proper is evidently a useful one, there being much information about tests, estimates, etc., but it is in a sense buried out of sight by the pictures.

The American Pneumatic Tool Co., of New York City, issues a catalogue which very clearly describes by text and illustration the pneumatic boiler calking tool and other specialties made by the company. The list of parties using this company's tools includes a number of prominent locomotive and car shops.

Standard Thermometer Co., Peabody, Mass.—This company has issued a new catalogue 8 x 10 in. in size, filled with handsome engravings of its metallic dial thermometers, thermostats, recording hydrometers, recording pressure gauges, telethermometers and various other instruments with somewhat longer names. The design, paper and presswork of this book are specially good, and a scroll at the end says that the credit for this is due to H. B. Prindle & Co. and E. B. Stillings & Co. of Boston.

TECHNICAL.

Manufacturing and Business.

The Latrobe Steel Works, Latrobe, Pa., is extending its machine shop equipment. This addition, with the tools which it will contain, will increase by about 50 per cent. the capacity of the firm for manufacturing tiers.

Carnegie, Phipps & Co. have imported from Germany for the Homestead Steel Works an important piece of machinery of which there is no duplicate in the United States. It is a steel saw weighing 110 tons, to cut nickel steel armor plate. These armor plates range in weight from 8 to 38 tons, and reach a length of 20 ft. and a thickness of 20 in. The saw has a blade 7½ ft. in diameter, geared above and revolving horizontally.

D. E. Garrison & Co., of St. Louis, have secured the contract for the rails, fastenings and switch fixtures for the Elk Mountain road of Colorado, and also for all the rails required by the Missouri Southeastern, and the Hearne & Brazos Valley, a large order for the St. Louis, Alton & Terre Haute, and many other contracts of minor note.

Mr. George S. Morison, Civil Engineer, has removed his Chicago office from The Rookery to Room 800, The Temple, corner of La Salle and Monroe streets. His New York office remains at 35 Wall street as heretofore.

It is reported that the Milwaukee Bridge Co. has arranged for the removal of its plant to Jackson, Mich., and expects to have its new works in operation in July, employing about 50 men.

The American Foundry Co., of Tacoma, Wash., is making about 1,000 chilled wheels a month. Quite a large number of these wheels are used by the Northern Pacific under cars built on the Pacific coast, and for renewals in that territory.

The New York Central & Hudson River road specified the hollow stay bolt iron made by the Falls Hollow Staybolt Co., of Cuyahoga Falls, O., to be used in the construction of the 100 locomotives, recently ordered of the Schenectady Locomotive Works.

"The Central Bridge & Engineering Co. of Peterborough (Limited)" has applied for incorporation in Ontario for the purpose of manufacturing steel and iron bridges and structural work. The capital stock is \$200,000.

The National Tube Works Co. has been awarded the contract for the pipe of the new pipe line to the seaboard, to be constructed by the Crescent Pipe Line Co. The line will be nearly 300 miles long, and will take about 5,000 or 6,000 tons of 5-in. pipe.

The Owego Bridge Works will soon have the plant of the old Southern Central shops at Owego, N. Y., in shape for the manufacture of iron and steel bridges. Most of the machinery and tools are in position and the company has already several large contracts.

The Pittsburgh & Western has just added to the machinery at the Allegheny shops a 300 ton wheel press which cost \$1,500, purchased from Bement, Miles & Co. of Philadelphia.

The Missouri Car & Foundry Co., of St. Louis, has increased its capital stock from \$750,000 to \$1,000,000.

Iron and Steel.

The Superior Malleable Iron Co., of Superior, Wis., has been reorganized and the capital stock increased from \$50,000 to \$100,000.

The Bessemer department of the old Worcester Steel Works, Worcester, Mass., has started up with a small force. The concern will hereafter be known as the New England Steel Works.

The Lima Steel Casting Co., of Lima, O., has been incorporated for the purpose of manufacturing steel castings by the crucible steel and open hearth process; also steel springs, wire, etc. The incorporators are: T. T. Mitchell, G. W. Disman, and others.

The Syracuse Steel Foundry plant, which was destroyed by fire during January, 1891, is about ready to resume operations, having been rebuilt upon a modern and much improved plan.

The Waukegan Iron & Steel Castings Co. has begun the manufacture of steel castings by a patent process which has been used in England.

The three largest iron and steel concerns in Wheeling,

W. Va., have consolidated under a new corporate title, with a capitalization of \$5,000,000. The concerns merged are the Wheeling Iron & Nail Co., the Belmont Iron Co., and the Benwood Iron Works. The combine takes in four blast furnaces, three cut nail factories, one sheet iron mill, one Bessemer steel plant, and three forges. The aggregate capital exchanged for stock in the new corporation is \$2,000,000. The new company will issue \$3,000,000 additional stock with which to erect a bridge works, a structural iron works, and a wrought tube mill.

The West Superior Iron & Steel Company has begun laying the foundations for a large addition to its plant. The new building will be 103 ft. by 252 ft., and will be constructed entirely of steel rolled by the company. This building will contain machinery for finishing the products of the plate and structural mills. Another building, to be used as a hammer shop, will be begun at once. The company will soon be prepared to execute orders for boilers, tanks, box and plate girders, as well as steel plates and structural forms.

New Stations and Shops.

J. H. Horne & Sons Company, Lawrence, Mass., has placed the contract for a new machine shop 64 ft. x 107 ft. with the Berlin Iron Bridge Co., of East Berlin, Conn.

The Norfolk & Western Railroad company has let the contract for the erection of new shops, round houses and other buildings at Kenova, W. Va., the point at which the road crosses the Ohio River. The round house is to have 18 stalls; the machine shops are to be 124 ft. by 112 ft., two stories; the blacksmith shop, 75 ft. by 65 ft.

The Baltimore & Ohio Southwestern will establish general repair shops at Chillicothe, O., the final agreement having been made this week, when the City Council passed an ordinance asked by the railroad. The matter has been under discussion about two years.

The Pennsylvania Co. has just completed plans for new passenger stations at Piqua and Urbana, O., on the Indianapolis division. The estimated cost is \$10,000 each.

The Brown & Sharpe Mfg. Co. is building a three story extension, 166 x 56 ft. in dimension, for storing patterns, of which there are about 40,000 in pretty constant use. On the first floor, space will be reserved for four bins for moulding sand with a capacity of 600 tons. The extension will be as nearly fireproof as possible and will be divided by 12-in. brick partition walls.

The Central of Georgia has let contracts for re-building its station at Macon, Ga., at a cost of \$25,000. Bids for the iron roof and trainshed have been received from several works, and contracts will soon be awarded.

The St. Louis, Iron Mountain & Southern will build a new brick freight house at Memphis immediately. The dimensions of the building have not yet been decided upon.

THE SCRAP HEAP.

Notes.

The second annual convention of the Car Inspectors' Protective Association of the United States was held in St. Louis this week.

The Supreme Court of Georgia has affirmed the constitutionality of the Glenn railroad tax bill, which permits each county to tax the value of railroad property within its limits.

The Railroad Commissioners of St. Louis have issued a circular to the railroads calling upon them to comply with the law requiring frogs, switches and guard rails to be blocked so as to prevent accidents to trainmen.

The track of the Illinois Central, which was badly damaged by water at its southern end, especially at Chattawa, Miss., was finally repaired on April 24. There were further very heavy rains in Louisiana on April 22.

The *Mexican Financier* says that an item, recently published in these columns, referring to the use of standard time on Mexican railroads has no foundation in fact. The roads of Mexico continue to use City of Mexico time, which is 36 minutes slower than Central time.

The Railroad Brotherhood Hospital Association of Chicago, which has carried on a sort of union employees' hospital in that city for two years, is trying to enlarge its establishment, and General Managers St. John, of the Rock Island, Earling, of the St. Paul, and Whitman, of the Northwestern, have been chosen trustees to receive contributions.

The Burlington's new fast train between Chicago and Denver is not to have the field to itself. The Union Pacific will also shorten the running time of its fast through train, and it said that the Rock Island will also take similar action. Mails from points east of Chicago will reach Denver about 13 hours earlier than heretofore.

The ferry boat "Cincinnati," of the Pennsylvania road, was somewhat damaged on Tuesday last by running against the piling at the side of the slip at Cortlandt street, New York, the order of the pilot to shut off steam having been ineffectual. On investigation it was found that the engineer, who was alone in his room, had fallen forward on the machinery and been crushed to death. Four passengers on the boat were injured.

A dispatch from Easton, Pa., states that the conductors of the Lehigh Valley have had their pay increased and changed from a monthly to a day rate. Numerous

rumors of discontent among the enginemen and other employees of this and other roads in the Reading system have been published lately, but they are so indefinite that the explanation offered by a Philadelphia newspaper, to the effect that stock jobbers have either started or greatly magnified the reports, seems to be correct. A considerable number of freight train crews have been discharged recently, but it does not appear that this action is essentially different from what has been taken in seasons of slack traffic in previous years.

The trainmen on the Milwaukee, Lake Shore & Western will have their pay raised May 1. Passenger conductors who now receive \$112 per month get an advance to \$125, 25 working days to constitute a month. Freight conductors will receive 3 cents a mile, 100 miles, or 10 hours, to constitute a day's work, each additional hour to be accounted equivalent to a run of 10 miles, paid for accordingly. Brakemen on freight trains will receive 2 cents a mile, with the same regulations as to hours and length of run as apply to freight conductors. Passenger brakemen will receive \$55 per month. Baggage men will be paid \$75 per month, which is an advance of \$15.

Spanish American Notes.

The Anglo-Peruvian Petroleum Co. has applied for permission to lay a pipe line to convey petroleum from Callao to Lima.

The Sao Pedro branch of the Rio do Ouro Railway, state of Rio de Janeiro, is completed and will at once be opened to traffic.

The Sao Paulo Railway from Santos to Sao Paulo, Brazil, has been compelled to discontinue sending messages for the general public over its telegraph line owing to the difficulty of obtaining operators.

The shareholders of the Sorocabana and the Ituana railroads, in the state of Sao Paulo, Brazil, have agreed to a fusion of these lines, forming a company to be known as the Uniao Sorocabana e Ituana, with an increase of capital stock from 38,000,000 to 70,000,000 milreis (par value about \$35,000,000). The total length of the two lines at present exceeds 300 miles, ramifying through the great coffee region of Sao Paulo. One object of the fusion is to secure sufficient financial strength to build an extension giving them an outlet to the coast at Santos.

The statement has gained currency that Honduras has revoked the charter of "an English syndicate for the building of the inter-oceanic railway" across that republic, and that the Government has given a concession for the line to New York capitalists. This would be important if true, but it needs more direct confirmation in view of the fact that Honduras has given everything she had to give—railroads, lands, infinite concessions—in liquidation of her foreign debt to a syndicate composed of her former bondholders, after the example set by the Grace contract with the Government of Peru.

Cheaper, Even, than "The Paint-Brush Method."

Orders have been issued by E. B. Taylor, General Superintendent of transportation of the Pennsylvania lines west of Pittsburgh, that the maximum car load weight for 60,000 lbs. capacity shall be 66,000 lbs.; for 50,000 lbs. capacity, 55,000 lbs. Other cars can be loaded 4,000 lbs. above capacity.—*Pittsburgh Post*.

Historical Exhibit of Tickets.

Mr. Geo. DeHaven, General Passenger Agent of the Chicago & West Michigan, is to make a historical collection of railroad tickets for the World's Fair. Persons having in their possession old, rare and curious tickets, time tables, etc., are requested to communicate the fact to Mr. DeHaven. He will also be glad to receive information as to the existence of objects of this kind in public or private collections anywhere. Objects loaned for this exhibit will be shown in specially prepared cases, and will receive the greatest care, so that no damage can occur to them. General passenger and ticket agents throughout the world and manufacturers of tickets are invited to correspond with Mr. DeHaven, as it is the intention to make the most complete exhibit possible of the tickets, passes, etc., used in all countries. Mr. De Haven's address is Grand Rapids, Mich., U. S. A.

Mexican Railroad Life.

A railroad man from the United States going to Mexico finds much to amuse him, and if he engages in railroad he will find a number of things to learn before he is a success. Much of the work must be done by natives, as they are more content and make fewer exorbitant demands than the better class of help from this country. Natives work slowly; promptness is not one of their characteristics. When a job is started it is difficult to estimate when it will be finished. Common laborers receive from 25 to 50 cents a day, and some of them are expensive at that price. As labor is cheap much work is done by hand which here would ordinarily be done by machinery. At many of the railroad water stations the water is pumped by hand. The native contracts to pump all the water required, for what is equivalent to \$21 in United States money a month, and out of this he lives and pays his own help. On learning that many of the locomotives burn wood, one naturally turns to see where it comes from. The mountains are bare, and there is but little wood in sight. But we find that it is carted some considerable distance, and what is more surprising, the most of it is carried on the backs of mules. Even with cheap labor this is expensive; but coal costs about \$20 a ton in some sections.

The Peons, that is, the lower working classes, are not at all particular about such little matters as veracity and honesty. It seems to be natural for them to steal, and more natural to prevaricate as a means of protection. Brass has a peculiar attractiveness for them, and only a few of the best workmen can be trusted with it. The brass foundry and shops are walled up, and have substantial doors and windows which are well barred. The other shops are generally open. It is not uncommon to have the lubricators stolen from engines. To guard against these sudden disappearances of vital parts, it is often necessary to resort to unusual methods of construction. For instance, in applying air brakes to freight cars, the coupling is placed directly on each end of the train pipe, and the connection between cars is made with one piece of hose. This is done to reduce the number of hose, and to make sure of keeping it, it is taken from the cars as soon as they are set out from a train. It is then stored under lock and key, and is issued to train-

men on requisition, and they are held responsible for its return.

As among other ignorant classes improvements are looked upon with disfavor, and the Peons and Mexicans, seeing that the air-brake reduces the number of men per train take every means possible to make it less effective, such as cutting out the rubber washers from the couplings and making holes in the train pipe, or anything to cause a leakage of air or a failure of the brake. In passing from El Paso into Mexico at dusk when the lamps are lighted the conductors pull down the blinds to hide the lights, for the Indians frequently throw stones through the windows.

The Big Brazilian Railroad Scandal.

The Brazilian public, and a goodly number of English investors as well, have recently been victimized by a gigantic railroad swindle, which resembles in some points the famous Grant-Ward affair in this country. The chief actor in the Brazilian episode, Henry Lowndes, is a young man of 29, who has acquired notoriety under the title of the Count of Leopoldina. His father was English, his mother, a daughter of the well known Andrew Steele, of Rio, was half Brazilian, and the title was bought from the crown of Portugal. The name of Leopoldina was evidently chosen partly for commercial reasons, since this would be financial Napoleon held large interests in the Leopoldina Railway, extending from the northern terminus of the Dom Pedro Segundo road into the state of Minas Geraes. During the speculative boom last year the young count arranged a combination between the Leopoldina Railroad and the English bank of Rio de Janeiro, whereby a new corporation known as the Banco de Credito Universal acquired control of the other two. On the strength of this arrangement the Count succeeded in floating debenture bonds in London, the money presumably to be applied to the resuscitation of the Leopoldina Railway. The success of this venture enabled the young "financier" to carry out a still bolder plan, the organization of a great company, the Companhia Geral das Estradas de Ferro do Brazil, whose purpose was to acquire control of a large group of roads and combine them into one grand system. The plan was claimed to offer advantages for more economical management. Several important lines came into the combination. The Count was made President, and his tool, Mello Barretto, Secretary and General Manager, and they had things their own way. The Companhia Geral made a brilliant showing in the beginning and soon began to pay dividends. The railroads were also apparently thriving under its management. But the company's condition soon became shaky, and it was noised about that a large creditor was threatening to force it into bankruptcy, and next came the collapse. The judicial investigation, just concluded, showed that for over six months no books had been kept, that only occasional entries had been made prior to that time; large sums were borrowed upon securities at high rates, out of which interest upon debentures and dividends were paid. Other loans for still larger sums were negotiated with which to pay previous indebtedness, a handsome margin mysteriously disappearing with each fresh transaction. But the limit was soon reached, and the stockholders in the duped railroads are now wondering how much they can keep the creditors of the Companhia Geral from swallowing up. Those English stockholders who did not explicitly sanction the combine are, as usual, falling back on the plea that the arrangement was void in the beginning, as far as it relates to them, without their vote in favor of it. Meantime the count has been shown the way to jail, after coolly remarking: "You may imprison me, but you can't get back the money. I'll keep that." His colleague, Barretto, has fled, some Brazilians hinting that they have had glimpses of him in New York. The history of this scheme makes one of the blackest pages in the recent financial history of South America, and it has done great harm to a number of struggling railroads.

The Unparalleled Previousness of Chicago.

The New York, Chicago & St. Louis ran an excursion from Fort Wayne and intermediate points to the World's Fair grounds on April 26, the fares being about one cent a mile. The Chicago *Inter-Ocean* presented each excursionist with a free admission ticket to the grounds.

Railroads and Politics.

Some one illustrates a certain similarity between cars and Congress by telling of the answer the conductor of a train made to a passenger who protested against being compelled to go inside the car. "What are platforms for, anyhow?" asked the angry passenger. "Platforms are not made to stand on," was the reply. "They are made to get in on."

Securities Listed on the New York Stock Exchange.

The Governing Committee of the Stock Exchange has listed the following securities:

Baltimore & Ohio—\$2,500,000 additional common stock, making a total amount to date of \$16,025,000.

Fulton Elevated—\$358,000 additional first mortgage 5 per cent. bonds.

Chicago, Burlington & Quincy—\$500,000 additional consolidated 7 per cent. bonds.

East Tennessee, Virginia & Georgia—Central Trust Co. certificates of deposit of preferred and common stock consolidated 5 per cent. bonds and equipment and improvement 5 per cent. bonds.

Green Bay, Winona & St. Paul—Farmers' Loan & Trust Co. certificates of deposit of common and preferred stock and bonds.

Louisville & Nashville—\$500,000 additional Winfield 4 per cent. bonds.

Chesapeake & Ohio—\$11,001,000 general mortgage 4½ per cent. bonds, issued under the refunding plan.

LOCOMOTIVE BUILDING.

The Duluth & Winnipeg will soon place an order for two locomotives.

The Connecticut River road received last week a new freight engine from the Schenectady Locomotive Works which is the largest on the road.

The Brooks Locomotive Works, of Dunkirk, have finished a very heavy engine for the Iron Range & Huron Bay Railroad, said to be one of the largest ever sent out by the works.

The Houston & Texas Central has received two locomotives of the lot ordered from the Cooke Locomotive Works at Paterson, N. J. These engines are ten-wheelers, the cylinders being 19 x 24 and the weight 125,000 lbs.

Master Mechanic F. B. Griffith, of the Delaware, Lackawanna & Western, has just completed at the East Buffalo shops the sixth engine built there. The engine has 19 x 24 in. cylinders and has 231 two-inch flues. The heating surface is 1,625 sq. ft.

The 30 locomotives to be built by the Richmond Locomotive Works for the Cleveland, Cincinnati, Chicago & St. Louis are all to be 10 wheel freight engines, with Belpaire boilers, weighing in working order about 132,000 lbs. The cylinders will be 19 x 24 in.

A Swedish paper announces that the Baldwin Locomotive Works have delivered a locomotive to the Borlänge Ostratorps Railway. This locomotive was designed by a Swedish engineer and bids were received from Swedish, English and American builders. The American manufacturers received the contract, not only on account of being the lowest bidders, but also on account of the time required for delivery. Other builders required a year's time while the Baldwins delivered the engine within ten weeks after receiving the order. A paper further states that "the engine is well built and has many improvements and attachments not heretofore seen in this section."

CAR BUILDING.

The Madison Car Co., of Madison, Ill., has a contract for the construction of 12 tank water cars for the Mexican Central for immediate delivery.

The Duluth & Winnipeg and the Duluth, Messabe & Northern are each in the market for 200 ore cars. The contract will be let in a few days.

The Minneapolis & St. Louis has placed an order for two combination passenger and baggage cars and five passenger cars with the Ohio Falls Car Co., of Jeffersonville, Ind.

The construction of 100 freight cars has just been commenced at the shops of the Mexican National at Laredo, Tex. This is the first order for new cars received by the works.

The Northern Car Co., of Minneapolis, has just built for the Minneapolis Street Railway Co. a vestibule street car for the line between Minneapolis and St. Paul. The company is building 70 cars for the Milwaukee street railroads.

The Wagner Palace Car Co. is building at East Buffalo 12 handsome passenger cars for the Adirondack and St. Lawrence. Two of these will be observation cars. A car for the transportation of horses, with stalls for fifteen horses, is also being built for Dr. W. S. Webb.

The Pullman Palace Car Co. is to build 12 parlor cars for the Southern Pacific. The cars will be different from those at present in use on the Southern Pacific, in that they will have two drawing rooms instead of one, and will be several feet longer than the cars now in use.

The United States Rolling Stock Co. has been reorganized under the laws of New Jersey as the United States Car Co. The capital stock of the new corporation is \$3,500,000, equally divided into common and preferred. The preferred stock is entitled to dividends at the rate of 5 per cent. per annum, but the stock is not cumulative. The incorporators are: Thomas F. B. Parker, of New Brunswick, N. J.; Robert S. Green, Jr., of Elizabeth, N. J.; Madison Grant and Augustus Fielding, of New York City, and David Cornfoot, of London, England.

BRIDGE BUILDING.

Allegany County, Md.—The county commissioners of Allegany County, Md., and Mineral County, W. Va., have held several joint meetings for the purpose of considering the advisability of building a bridge over the Potomac River somewhere in the vicinity of Bull Neck. It was finally decided last Friday to build a bridge and several locations were inspected but none was definitely selected. Another meeting will be held in May to decide upon a location and in the meantime surveys of the most available points will be made.

Cambridge, Mass.—Sealed proposals will be received at the City Hall, Cambridge, until May for the construction and erection of a wrought iron and steel plate girder highway bridge over the tracks of the Fitchburg Railroad at Walden street, North Cambridge. The bridge to be 63 ft. in length, and 42 ft. in width.

Crete, Neb.—The Saline County Commissioners have let a contract for a new iron bridge over the Blue River at this place to the Clinton Bridge Co. for \$5,000. The structure is to be completed Aug. 20.

Cumberland, Md.—The West Virginia Central & Pittsburgh has received bids for the erection of an iron trestle, at Cumberland, half a mile in length to take the place of the present wooden structure. The contract has not been let, but it calls for a metal trestle with stone foundations, to be erected without interruption to traffic.

Fort Wayne, Ind.—The County Commissioners have been asked to make an appropriation for the erection of a bridge across the Maumee River, near Harmer street.

Grand Rapids, Mich.—The Board of Supervisors has been petitioned to compel the Chicago & West Michigan to put a draw in its bridge across the river according to a clause in the ordinance for the bridge granted 11 years ago.

Kansas City, Mo.—William H. Lee, of Boston, states that the bondholders of the Winner Bridge Co. have agreed to advance the money to pay the debt of \$300,000 and proceed with the work. This bridge is being built over the Missouri River by the Kansas City Bridge & Terminal Co.

New Brunswick, N. J.—The contract for the stone bridge over the Raritan River recently awarded to Dean & Westbrook, of Jersey City, will probably be annulled by the Board of Freeholders on account of charges of irregularity. The contract for the stone arch bridge was \$190,000, but it is now likely that a new contract will be let for an iron structure at about half that amount. There is a division of sentiment in the town as to whether a stone or an iron bridge should be constructed, and litigation may follow the final decision of the freeholders whichever way it may be.

New York City.—Hearings have been held before the Senate and House Committees on Commerce in the matter of the New York and New Jersey Bridge. Earlier attempts to get a congressional charter for this bridge, in this session, were killed in committee. The present

effort is to have the bill reported by the Commerce Committee. The arguments for and against are too familiar to be repeated here. The House Committee has voted to make a favorable report on the bill.

Ottawa, Ont.—Ground was broken for the Inter-provincial bridge across the Ottawa river between Ottawa and Hull, Ont., last week. Negotiations now going on between the Parry Sound and Pontiac Pacific Junction roads may result in the immediate construction of the bridge. The bridge will be constructed on five stone piers, 40 ft. above high water mark. The spans will be from 200 to 500 ft. in length, the longest being from the Ottawa side to the first pier. There will be a single railroad track, with wagon ways on each side and foot walks. The bridge will be iron.

Parkersburg, W. Va.—The old span of the Baltimore & Ohio bridge across Ann street, at Parkersburg, was taken out and moved away last Thursday, and a new span of solid iron placed in position before 3:15 in the afternoon. There are several other spans of the same bridge to be removed and replaced in the same manner.

Point Pleasant, Pa.—The stockholders of the Point Pleasant Bridge Co., whose property across the Delaware River in Bucks County was destroyed by fire, have decided to build an iron structure on the stone piers which remain standing.

Sutton, W. Va.—All the superstructure for the West Virginia & Pittsburgh Railroad bridge over Elk River near Sutton has been delivered on the ground, and the work of erecting it has been commenced.

Thompsonville, Conn.—About \$30,000 has been subscribed toward building a new bridge over the Connecticut River at this place. About \$60,000 will be required.

Tyler County, W. Va.—The County Court of Tyler County has advertised for bids for the erection of a steel highway bridge over Indian Creek at the point where the Sutton and Sarnac turnpike crosses said creek. The bridge is to be two spans, 85 ft. each, on masonry piers.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Baltimore & Ohio (Main Line), quarterly, 1½ per cent. on the common stock, payable May 17, and 5 per cent. on the Washington Branch, payable May 2.

Boston & Maine, semi-annual, 4 per cent. on the common stock, payable May 16.

Buffalo, Rochester & Pittsburgh, quarterly, 1½ per cent. on the preferred stock, payable May 16.

Rome, Watertown & Ogdensburg, quarterly, 1½ per cent. on the capital stock, payable May 16.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Allegheny Valley, a annual, Philadelphia, Pa., May 2.

Brooklyn Elevated, annual, Brooklyn, N. Y., April 30.

Canada Southern, annual, New York City, N. Y., June 1.

Canadian Pacific, annual, Montreal, P. Q., May 11.

Central of New Jersey, annual, Jersey City, N. J., May 6.

Chartiers, annual, Philadelphia, Pa., May 3.

Chicago, Burlington & Quincy, annual, Chicago, Ill., May 18.

Chicago, St. Paul, Minneapolis & Omaha, annual, Hudson, Wis., June 4.

Cincinnati, Hamilton & Dayton, special, Cincinnati, O., May 9.

Delaware & Hudson Canal Co., annual, New York, May 10.

Eastern of New Hampshire, annual, Portsmouth, N. H., May 3.

Elmira & Lake Ontario, annual, New York, N. Y., May 5.

Lake Shore & Michigan Southern, annual, Cleveland, O., May 4.

Michigan Central, annual, Detroit, Mich., May 5.

Missouri, Kansas & Texas, annual, Parsons, Kan., May 18.

New York, Chicago & St. Louis, annual, New York, N. Y., May 4.

New York & Harlem, annual, New York City, N. Y., May 17.

New York & New England, annual adjourned, Boston, Mass., May 31.

Norfolk & Western, annual, Roanoke, Va., May 4.

Omaha & St. Louis, annual, Stanberry, Mo., May 17.

Panhandle of Texas, annual, Washburn, Tex., May 3.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 18.

Pittsburgh, Virginia & Charleston, annual, Philadelphia, Pa., May 3.

Pittsburgh & Western, annual, Allegheny City, Pa., May 2.

St. Louis, Alton & Terre Haute, annual, St. Louis, Mo., June 6.

St. Louis, Iron Mountain & Southern, special, St. Louis, Mo., May 27.

St. Louis Southwestern, annual, St. Louis, Mo., May 4.

St. Louis Southwestern of Texas, annual, Tyler, Tex., May 2.

Spartan, Duvall & Port Morris, annual, New York City, N. Y., May 17.

Thomsonville, Silver Valley & Pee Dee, annual, Thomsonville, N. C., May 5.

Traverse City, annual, Traverse City, Mich., May 5.

Virginia & Truckee, annual, Virginia, Nev., May 10.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The **Association of Railway Accounting Officers** will hold its fourth annual meeting at the Auditorium Hotel, Chicago, Ill., May 25.

The **American Institute of Electrical Engineers** will hold its next annual meeting at the Grand Pacific Hotel, Chicago, Ill., June 6.

The **American Society of Civil Engineers** will hold its next annual convention at the Hygeia Hotel, Old Point Comfort, Va., June 8.

The **Master Car Builders' Association** will hold its annual convention at Congress Hall, Saratoga Springs, N. Y., June 15.

The **American Railway Master Mechanics' Association** will hold its annual convention at Congress Hall, Saratoga Springs, June 20.

The **American Association of General Baggage Agents** will hold its next annual meeting at Mackinac Island, Mich., July 28.

The **New England Railroad Club** holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The **Western Railway Club** holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The **New York Railroad Club** holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The **Southern Railway Club** holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The **Central Railway Club** meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November. By special resolution the next meeting will be held in April.

The **Northwest Railroad Club** meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The **Northwestern Track and Bridge Association** meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The **American Society of Civil Engineers** holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The **Boston Society of Civil Engineers** holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The **Western Society of Engineers** holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The **Engineers' Club of St. Louis** holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The **Engineers' Club of Philadelphia** holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The **Engineers' Society of Western Pennsylvania** holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The **Engineers' Club of Cincinnati** holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The **Civil Engineers' Club of Cleveland** holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The **Engineers' Club of Kansas City** meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The **Engineering Association of the South** holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The **Denver Society of Civil Engineers and Architects** holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The **Civil Engineers' Society of St. Paul** meets at St. Paul, Minn., on the first Monday in each month.

The **Montana Society of Civil Engineers** meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The **Civil Engineers' Association of Kansas** holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The **American Society of Swedish Engineers** holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The **Engineers' Club of Minneapolis** meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The **Canadian Society of Civil Engineers** holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The **Association of Civil Engineers of Dallas** meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The **Technical Society of the Pacific Coast** holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The **Tacoma Society of Civil Engineers and Architects** holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The **Engineers and Architects' Club of Louisville** holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

The **Association of Engineers of Virginia** holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

American Society of Mechanical Engineers.

The following is the docket of papers for the San Francisco meeting in May.

C. H. Peabody, "Economy and Efficiency of the Steam Engine;" B. J. Dashiell, "The Electric Railway as Applied to Steam Roads;" A. F. Nagle, "The Density of Water at Different Temperatures;" Wm. O. Webber, "Some Tests of a Portable Boiler;" Wm. S. Aldrich, "Compounding Centrifugal and Load Governing by a Rotary Piston Valve;" John Richards, "Notes on a Problem in Water Power;" W. F. M. Goss, "An Experimental Locomotive;" A. W. Stahl, "Utilization of Power of Ocean Waves;" John H. Cooper, "A Self Lubricating Fibre Graphite for the Bearings of Machinery;" Thomas Gray, "Autographic Recording Apparatus for use in Testing Materials;" Thomas Gray, "The Measurement of Power;" Harris Tabor, "Machine Moulding;" F. M. Rites, "The Steam Distribution in a Form of Single Acting Compound Engine;" Gus. C. Henning, "On the Elastic Curve and Treatment of Steel;" C. H. Manning, "A Novel Fly Wheel;" W. R. Eckart, "Friction or Lost Work of Cable Railways;" W. W. Christie, "An Experiment with Aluminum;" Denton and Jacobus, "Summary of Results of Principal Experimental Measure-

ments of Performance of Refrigerating Machines," Green and Rockwood, "Two Cylinders vs. Multicylinder Engines."

Engineering Association of the South.

The regular April meeting of the association was held at Nashville, Tenn., April 14. Vice-President F. P. Clute, of South Pittsburg, Tenn., presided. The election of the following members was reported: William W. Carson, Professor of Civil Engineering University of Tennessee, Knoxville, Tenn.; Henry L. Collier, of Atlanta, Ga.; Chas. E. Hamlin, Engineer and Manager Southern Office of the King Iron Bridge Co., Chattanooga, Tenn.; Benjamin M. Hall, of Hall Bros., Civil and Mining Engineers, Atlanta, Ga.; Arthur G. King, Engineer Atlanta, Ga.; Henry M. Robert, Lieutenant Colonel of Engineers U. S. A., Nashville, Tenn. As Juniors: Philip H. Porter, Nashville, T. B. Somerville, Chattanooga. The paper of the evening was entitled "Municipal Engineering in Chattanooga" by Mr. James A. Fairleigh, of Chattanooga.

Engineers' Club of Cincinnati.

At the last regular meeting of the club 13 new members were elected, making the membership 123. Col. Latham Anderson read a paper entitled "A Proposed New Type of Dam." This dam is to be constructed for an irrigating system for supplying the territory north and west of San Bernardino, Cal.

Engineers' Club of St. Louis.

The club met April 20, President Johnson in the chair. Capt. C. L. Palfrey was elected a member of the club.

Mr. F. B. Crowe read a paper on "Elements Involved in Rapid Transit." The subject was divided into two parts: first, the development of a new system, and second, the study of methods to increase the efficiency of lines already in existence. The greatest drawbacks to rapid transit have been the poor roadbeds and poorly designed curves which answered the purpose for the horse cars, but were inadequate for the present system. The terminal facilities was another point which made trouble when it was attempted to run a number of trains with a small headway. The question of stops was one which presented serious difficulty to obtaining any high rate of speed. The paper also dwelt on the question of car construction and showed some of the advantages obtained by newer and better designs. Discussion followed by Messrs. Hermann, Crow, Seddon, Moore, Johnson, Crosby, Olshausen, Maxon, Colby, Russell, Woods.

A paper by Professor Howe on "The Maximum Stresses in Drawbridges" was announced for the next meeting, May 4.

New England Railroad Club.

The regular meeting of the club will be held at the United States Hotel, Boston, Wednesday, May 11, at 7:30 p. m. The subject for discussion is rule 8 of code of rules of Master Car Builders' Association, and other rules that may be suggested at the time. Col. Frank H. Forbes will read a paper on the railroad system of Massachusetts 50 years ago, with personal reminiscences.

PERSONAL.

—Sir James Joseph Allport, Chairman of the Midland Railway Co., of England, is dead, at the age of 81 years. He served for 22 years as a director of the company.

—Mr. J. H. Morley, Canadian Passenger Agent of the Chicago & North Western, has accepted the appointment of General Passenger Agent of the Richelieu & Ontario Navigation Co.

—Mr. John H. Jones, for many years in charge of the bureau of anthracite coal statistics in Philadelphia, has accepted the position of General Freight Agent of the Philadelphia & Reading, formerly held by him.

—A Cleveland paper reports that Mr. J. T. R. McKay, General Freight Agent of the Lake Shore & Michigan Southern, and Mr. J. G. James, Assistant General Freight Agent of the same road, have decided to resign their positions on account of continued ill health. Both officers have been in the South for some time.

—Mr. Nicholas J. Power has been named as Mr. Edgar's successor as General Passenger Agent of the Grand Trunk. Mr. Power entered the service of the Great Western Railway, now part of the Grand Trunk system, in 1838, and rose gradually to the place of Assistant Accountant, to which he was appointed in 1882.

—Mr. T. S. Davant, who has been General Freight Agent of the East Tennessee, Virginia & Georgia since March, 1887, resigned this week, and has been appointed General Freight Agent of the Norfolk & Western. The office of General Freight Agent of the East Tennessee road will be abolished and the duties assumed by the Traffic Manager.

—Mr. George H. Coryell has opened an office as consulting engineer in the Washington Loan and Trust Building, Ninth and F streets, Washington, D. C. Mr. Coryell was for some time Chief Engineer of Surveys of the West Virginia Central & Pittsburgh road, but has declined a reappointment with the railroad in order to engage in the practice of his profession.

—Mr. W. A. Stowell, Superintendent of Construction of the Concord & Montreal, has resigned, and accepted the position of General Manager of the Montpelier & Wells River road. Mr. Stowell was formerly Superintendent of the White Mountains division of the Boston & Lowell and other roads in Northern New England. He was General Freight and Passenger Agent of the Montpelier & Wells River road in 1873.

—Mr. Edgar Van Etten, Superintendent of the Western division of the Lehigh Valley, has tendered his resignation, to take effect on May 1. He is to take the office of Assistant General Superintendent of the Rome, Watertown & Ogdensburg. Mr. Van Etten was formerly Superintendent of the Buffalo division of the New York, Lake Erie & Western road, and resigned to take the office of Manager of the Western New York Car-service Association, which position he held until his appointment as Superintendent of the Western division of the Lehigh Valley on March 1.

—Lieut. William Henry Dixon, Assistant General Passenger Agent of the Chicago, Milwaukee & St. Paul, died at his residence in St. Paul, of bronchitis, on the 20th inst. Mr. Dixon was in his 48th year, and had been continuously engaged in railroad service for 23 years. He began his railroad career in 1866 with the Chicago, Hamilton & Dayton, and was successively in the employ of the St. Paul & Sioux City, the Chicago, St. Paul, Minneapolis & Omaha, and the Chicago, Milwaukee & St. Paul, until 1881, when he became in turn a Commissioner

of the Western Trunk Lines Passenger Association, Secretary Western Association of General Passenger and Ticket Agents, Secretary of the Chicago Railroad Association, and Commissioner of Passenger Traffic between Chicago and St. Louis. In 1883 he again entered the service of the Chicago, Milwaukee & St. Paul, occupying the position of General Northwestern Passenger Agent until March, 1885, when he was appointed Assistant General Passenger Agent of the same line, holding that position at the time of his death.

ELECTIONS AND APPOINTMENTS.

Asheville & Bristol.—The company has been organized with William M. Cooke, Jr., President; William Hensley, Vice-President, and A. R. Eskridge, Secretary.

Chicago, Rock Island & Pacific.—A. J. Hitt has been appointed Superintendent of the Eastern Division, with headquarters at Horton, Kan.

C. H. Hubble, whose name was incorrectly printed last week, has been transferred to the Western Division, with headquarters in Colorado Springs, Colo. He succeeds S. B. Hovey, who has been transferred to the Southwestern Division, to succeed Mr. Hubble, with headquarters at Herington, Kan.

Cincinnati, Richmond & Ft. Wayne.—At the annual meeting of this company held in Richmond, Ind., April 7, the following directors were elected: William Parry, C. C. Binkley, John F. Miller and C. E. Reeves, Richmond, Ind.; David Studebaker, Decatur, Ind.; J. T. Brooks, Thomas D. Messler and James McCrea, Pittsburgh; William O. Hughart, William R. Shelby and T. J. O'Brien, Grand Rapids, Mich. The board elected the following officers: William Parry, President, Richmond; Wm. O. Hughart, Vice-President, Grand Rapids, and F. A. Gorham, Secretary and Treasurer, Grand Rapids. The company is controlled under lease by the Grand Rapids & Indiana Railroad.

Ellwood Connecting.—The directors are: James H. Reed, Pittsburgh, Pa., President; John Z. Robinson, James M. Bailey, and Geo. B. Motheral, all of Pittsburgh, Pa. The company was incorporated in Pennsylvania last week.

Fort Dodge & Northwestern.—At the first meeting of the stockholders at Fort Dodge, Ia., April 19, officers were elected as follows: President, Hamilton Browne; Vice-President, Thomas W. Carpenter; Secretary and Treasurer, R. C. Garabrant.

Grand Rapids & Indiana.—The directors elected the following officers at a meeting held in Pittsburgh on April 22: President, W. O. Hughart; Vice-President and Treasurer, W. R. Shelby; 2d Vice-President and General Manager, J. H. F. Hughart; Secretary and Auditor, F. A. Gorham; General Passenger and Ticket Agent, C. L. Lockwood, and General Freight Agent, E. C. Leavenworth; Superintendent of Southern Division, P. S. O'Rourke; Superintendent of Northern Division, W. B. Simson; Chief Engineer, G. S. Johnson. The only change is the election of Mr. Gorham as Secretary, in place of J. H. F. Hughart, who was promoted to be 2d Vice-President and General Manager last summer.

Grand Trunk.—N. J. Power has been appointed General Passenger Agent vice William Edgar, deceased. Mr. Power is promoted from the office of Assistant Treasurer of the company. G. T. Bell, for a number of years chief clerk in the passenger department of the road, has been made Assistant General Passenger Agent.

Hoxie & Pocatotas.—The incorporators are: J. H. Moran, of Walnut Ridge, Ark., President; William D. Gentry, of Chicago, Vice-President; Richard D. Moran, of Hoxie, Ark., Secretary and Treasurer; and John T. Gibson, of Black Rock, and John A. Shea, of Walnut Ridge.

Lake Roland Elevated (Baltimore).—At a meeting of the stockholders of this company, recently organized, the following directors were elected: S. M. Jarvis, Frank Slingluff, Roland R. Conklin, L. Riggs, Jesse Hilles, W. H. Whitridge and E. H. Bouton. Wm. H. Whitridge was elected President; Jesse Hilles, Vice-President, and E. H. Bouton, Secretary and Treasurer.

Monterey & Mexican Gulf.—General Manager J. A. Robertson has been appointed Receiver at the instance of the local creditors in Mexico.

New Orleans & Northwestern.—The annual meeting took place in Natchez, Miss., April 18, and the following directors were elected: Charles Hyde, of Plainfield, N. J.; Francis DeL. Hyde, of New York; L. K. Hyde, of Titusville, Pa.; L. V. F. Randolph, of New York; A. C. Craney, of Illinois; E. S. Drake, of Port Gibson, Miss.; T. E. Morrison, A. H. Foster, James W. Lambert, of Natchez, Miss. The directors elected the following officers: L. K. Hyde, President; T. E. Morrison, Francis DeL. Hyde and A. C. Craney, Vice-Presidents; James W. Lambert, Secretary; Charles Hyde, Treasurer.

New York & Boston Inland.—The names of the following directors were given in the Connecticut charter filed last week: Franklin Mead, E. D. Hewins, and T. B. Everett, of Boston; J. P. Day, of Brookline, Mass.; D. Luther Briggs, Leonard Bailey, L. Harris Warner, F. H. Alvord and E. R. White, of Middletown, Conn.

New York Central & Hudson River.—The board of directors have organized by re-electing Cornelius Vanderbilt Chairman of the Board; Chauncey M. Depew, President; C. C. Clarke, First Vice-President; H. J. Hayden, Second Vice-President; E. V. W. Rossiter, Treasurer, and E. D. Worcester, Secretary.

New York Connecting.—The directors for the first year are Oliver W. Barnes, Henry J. Davidson, Jr.; John McDonald, Frank M. Clure, Charles W. Mackey, Alfred P. Bolter, H. S. Welles, Thomas S. King, and Willis B. Barnes, all of New York City.

New York, Lake Erie & Western.—F. B. Smith, General Foreman, will, until further orders, perform the duties of the Master Mechanic of the First and Second divisions of the road.

Northern Pacific.—S. G. Mason has been appointed traveling passenger agent, with headquarters at Buffalo, N. Y.

Pennsylvania.—J. G. Searies, Division Freight Agent with headquarters in Baltimore, will be transferred to Philadelphia on May 1, to take charge of the coal freight business of the company.

Pennsylvania Lines West of Pittsburgh.—On May 1, the office of L. F. Loree, the Superintendent of the Cleveland & Pittsburgh Division, will be transferred from Wellsville, O., to Cleveland, O.

Philadelphia & Reading.—John H. Jones has been appointed General Coal Freight Agent, his jurisdiction extending over all lines owned and controlled by the road, including the Port Reading lessee of the Central of New Jersey. His office will be in the Manhattan Life Building, Fourth and Walnut streets, Philadelphia.

Port Royal & Augusta.—W. J. Craig has been appointed to the position of General Freight and Passenger Agent of this road and the Port Royal & Western Carolina with headquarters at Augusta, Ga. Mr. Craig has been Division Freight Agent at Columbus, Ga.

St. Joseph & Grand Island.—A. C. Hinckley, Master Mechanic of the Utah Division of the Union Pacific, has been transferred to this road, with headquarters at St. Joseph, Mo.

St. Louis Southwestern.—C. J. Pickering, who has been General Agent at Houston, Tex., for about two years, has been appointed Division Freight Agent of the road, with headquarters at Little Rock. He succeeds Douglas Dallam, resigned.

Southern Pacific.—R. P. Schwerin, late Lieutenant of the United States Navy, has been appointed General Purchasing Agent of the road.

Union Pacific.—At the annual meeting of the stockholders at Boston, April 27, James Sharp was elected to fill the vacancy in the Board of Directors caused by the death of his father, and Gardiner M. Lane and Samuel Carr were elected in the places of Marcus A. Hanna and S. H. H. Clark. With these exceptions the board remains the same as last year, the directors being: Frederick L. Ames, Edwin F. Atkins, Samuel Carr, F. Gordon Dexter, Boston; Henry H. Cook, Sidney Dillon, Henry B. Hyde, New York; Grenville M. Dodge, Council Bluffs, Ia.; Marvin Hughitt, Chicago; Joseph H. Millard, Omaha, Neb.; Alexander E. Orr, New York; James Sharp, Salt Lake City; Gardiner M. Lane, Boston; Jay Gould and Russell Sage, New York. The "foreign" ticket was defeated by 10,000 votes, the amount Russell Sage received over Charles C. Jackson. The election was decided in favor of Mr. Gould by the proxy of Messrs. Borthwick, Work & Co., of London, for 26,000 shares. At a subsequent meeting of the directors for organization, Samuel Carr resigned as a director, and S. H. H. Clark was chosen to fill the vacancy. Sidney Dillon declined re-election to the Presidency and Mr. Clark was elected in his place, Mr. Dillon being elected Chairman of the Board, a position created for him. Edwin F. Atkins was made Vice-President to succeed Mr. Clark, and the latter was made a member of the Executive Committee in place of Russell Sage. Comptroller Oliver W. Mink, Treasurer James G. Harris, and all the other officers were re-elected.

Valley (Ohio).—The annual meeting of the stockholders was held at the Wade building, Cleveland, O., April 20; L. V. Bockius, J. E. French and Charles F. Mayer were elected directors to serve for three years. The new board of directors elected Thomas M. King, President, and H. M. Keim, Secretary and Treasurer.

West Shore.—The annual meeting of the company was held at Albany, N. Y., April 20, and the directors of last year were re-elected as follows: Cornelius Vanderbilt, William K. Vanderbilt, Frederick W. Vanderbilt, Chauncey M. Depew, Asahel Green, J. Pierpont Morgan, Charles C. Clark, Edward D. Adams, Horace J. Hayden, Samuel F. Barger, J. Hood Wright, Charles Lanier and Charles E. Tracey.

C. L. Van Woert has been appointed Division Freight Agent between South Bethlehem and Bowmansville, N. Y., in addition to his duties as State Agent for the fast freight lines operating over this road. His headquarters will be at Syracuse, N. Y.

Yakima, Naches & Eastern.—The incorporators are George Donald, J. R. Patton, Edward Whitson, G. M. McKinney and H. J. Snively, of North Yakima, Wash.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Abbeville & Waycross.—It is said that negotiations have recently been begun, and are likely to be carried through, for the sale of this road to the Savannah, Americus & Montgomery, with which it connects at Abbeville. The line is about 20 miles long, extending south to Swan Creek, and if the transfer is made, it is expected that the line will be extended south toward Fort Valley.

Asheville & Bristol.—The projectors state that grading on this road will begin at once near Asheville, N. C. The line is to extend north from that town toward Bristol, intersecting the Bristol, Elizabethtown & North Carolina road. An election will soon be held in Asheville on the proposition to vote the company a subsidy of \$100,000. William M. Cooke, Jr., is President.

Astoria & Portland.—Contracts for the entire construction work on this line have been awarded to H. J. Reilly, of 33 Broadway, New York City. The grading and tunnel work has been sublet to Corey Bros. & Co., of Ogden, Utah. About 16 miles of track has been laid south of Astoria, Or., to near Hillsboro, and 15 miles of grading additional is nearly ready for the rails. The work south of Hillsboro will be heavy and difficult. The maximum grade will be over two per cent. A number of long trestles will have to be built and one tunnel 1,600 ft. long. The line between Astoria and Portland is about 130 miles long. The route has been surveyed via the Nehalem Valley, reaching the towns of Jewell, Verona and Hillsboro. George Goos, Chief Engineer of the Rio Grande Western, is the Chief Engineer of the road.

Au Sable & Northwestern.—The grading is in progress on a western extension of this road along Au Sable River from Potts to Twin Lakes, Mich. The line will be in operation in July.

Baltimore & Ohio.—The contract for the first few miles of the Fairmont, Morgantown & Pennsylvania extension has been awarded to Lane & Co., of Baltimore, who will begin the grading this week just below Morgantown, W. Va. The contracts for work below that of Lane & Co. will be let as soon as the reports of the engineers who are locating the branch to the state line have finished their work. The company has only to build to the state line, nine miles, when it will have a connection through to Pittsburgh. The contract has been let for the work from Uniontown, Pa., south to the state line, which will close the connection. Work on the line from the state line to Uniontown, by way of Smithfield, has been in progress for some time.

Charleston, Sumter & Northern.—Surveys have recently been begun for a line from Bennettsville south to Gibson Station, S. C., a distance of 30 miles. This line

was surveyed last fall by a local company, whose franchises have since been absorbed by this road.

Chicago, Fort Madison & Des Moines.—The right of way for the proposed extension to Ottumwa, Ia., has been secured for the entire distance, and the directors will begin the grading early next month. It is expected to have trains running to Ottumwa by July. The new line will be about 18 miles long. A subsidy of \$30,000 has been voted by the town of Ottumwa, and other grants have been made by the towns along the line. Surveys have been made west of the latter town, but it is not proposed to build beyond Ottumwa this year.

Chicago Lake Street Elevated.—The capital stock of this company has been increased from \$3,000,000 to \$5,000,000, for the purpose of extending the line to Oak Park and other suburbs of the city.

Chicago, Rock Island & Pacific.—The operation of the extension now building to the Red River was begun last week, and trains are now running for a distance of 18 miles south of Minco, I. T. to a station called Chikasa.

Clarksville Mineral.—Joseph Coyne & Bro., of Louisville, Ky., have been awarded the contract for completing the unfinished gap of seven miles on this branch of the Louisville & Nashville. This work is on the middle section of the route between Marion and Van Leer, Tenn.

Colorado Midland.—Richard Clough, of Denver, has been awarded the contract for the Cripple Creek branch. The road will be 18 miles long, extending from near Hayden, Colo., north to a point four or five miles beyond the town of Fremont to Beaver Park. The country through which the line is to pass is quite mountainous, and owing to the amount of blasting which will be required, it is not thought the line can be completed before the fall months.

Duluth & Iron Range.—The contract for the construction of the branch from Messabe station to the new iron fields on the Messabe Range has been let to Winston Brothers, of Minneapolis. This branch will reach the town of Merritt, Minn., as well as a number of mines. It will be about 20 miles in length, and it is the intention to complete the work within 60 days.

Duluth & Northwestern Terminal Co.—This company was incorporated in Minnesota last week, with headquarters in Duluth, by W. C. Sargent and C. H. Graves, of Duluth; Thomas C. Hallibus, of New York, and D. M. Edgerton, of Kansas City. The capital stock is \$1,000,000. The company proposes to build a railroad terminal on Minnesota Point, and offers to connect the peninsula with the mainland by a tunnel, under the ship canal, if the city of Duluth will grant right of way for the road along certain streets in Duluth.

Fall Brook Coal Co.—The officers of the company deny the report that it is contemplated to build a new line from Corning to Penn Yan, N. Y. They state that there is no truth whatever in the statement.

Findlay, Fort Wayne & Western.—The engineers are surveying an eastern extension through Hancock County, O., and it is said that grading will begin early in May. A line has been run from Findlay, passing about eight miles south of Tiffin. This is the first important town to the east and a new survey will be begun at once for a route through Tiffin.

Fort Dodge & Northwestern.—The organization of this company was completed at Fort Dodge, Ia., last week, and Hamilton Browne was elected President. It was arranged to begin surveys between Fort Dodge and Pocahontas Centre, Ia., a distance of 25 miles, about May 1.

Galveston & Western.—The transfer of this road to the newly incorporated Galveston Terminal Co. has been delayed, and the new owners are desirous of beginning the extension to South Galveston as soon as possible. D. H. Perky, who obtained the option, has made a proposition to the directors to have the extension undertaken by the present company at once. This has not been accepted, and the branch, therefore, can not be commenced for another month, when the road will probably be transferred.

Grand Trunk.—A survey is being made for a line from Madoc, Ont., a point on the branch running north from near Belleville, in a southeasterly direction to Tweed, a distance of 10 miles. The branch from Madoc northerly to Bridgewater is being repaired, and will soon be in operation.

Houston Central, Arkansas & Northern.—The bridge across Red River at Alexandria, built by the Union Bridge Co., was finally completed last week and accepted by the engineers of the company. The delay in completing this bridge has been the principal cause of postponing the opening of the line. The ballasting has now been finished and the stations along the line built, so that through trains will probably begin running about May 1, as announced.

Hoxie & Pocahontas.—The charter for this company was filed in Arkansas last week, the incorporators being J. H. Meran, of Walnut Ridge, Ark., and W. D. Gentry, of Chicago and others. The road is to extend from Hoxie through Randolph County to a point on the Northern State line of Arkansas, a distance of about 35 miles. The survey for the line will be made immediately.

Kansas City, Watkins & Gulf.—The tracklaying on this road has been completed for a distance of 94 miles north of Lake Charles, La., and is now within a point of four miles from Alexandria. There is now nothing to delay the construction and the rails will probably be laid into Alexandria, the northern terminus, next week.

Lancaster, Cecil & Southern.—The first contract for grading on this line was let last week, the contractor being Thomas H. Cornell, of Wilmington, Del. The work awarded begins at Child's Station, on the Philadelphia division of the Baltimore & Ohio, and extends to New Providence, 4½ miles. The contracts include the grading and ballasting and the erection of four iron bridges, and are said to amount to \$68,000. The balance, nine miles from Providence to Oxford, Pa., will be under construction soon after the first section is finished.

Mankato & Northeastern.—The franchise granting right of way through the city of Mankato, Minn., has not yet been passed but it undoubtedly will be at an early meeting of the city council. As soon as these matters are settled, the company will be ready to receive tenders for constructing the line.

Marion & Rye Valley.—The town of Marion, Va., has accepted a proposition insuring the construction of the line. This road is to be constructed from Marion, on

the Norfolk & Western, to the iron and manganese mines in Curran valley, a distance of 6½ miles. Nearly two miles has been graded, and the road will be pushed to completion. G. W. Richardson is Vice-President.

Meadow Creek.—The locating survey for this road in Fayette County, W. Va., is now in progress. The contract for the first two miles has been let to Feelev & Breen, of Alexandria, Va. The work on the line will be heavy, as it extends through a mountainous country. The road is projected to reach the Meadow Creek coal mines, owned by M. Henry, Cooper & Co., and E. S. Hackett is the Chief Engineer.

Mexican Southern.—This company has arranged with the contractors to have them operate the line until September, 1892. The traffic earnings are steadily increasing in a satisfactory manner. Before the end of the year the line will be opened to Oaxaca, Mex., 90 miles south of Icomavaca, and will tap a rich mining country which has heretofore suffered from the lack of railroad facilities.

Minnesota & Wisconsin.—This company has been chartered in Wisconsin, with a capital stock of \$150,000, to build a line 100 miles in length, connecting the Chippewa Valley branch of the Chicago, Milwaukee & St. Paul with the Chicago, St. Paul, Minneapolis & Omaha and Wisconsin Central. The incorporators are R. B. Landon and H. C. Truesdale, of Minneapolis; D. M. Sabin, of Stillwater, and D. C. McKay and William Gilbert, of Wildwood, Wis.

Missouri, Kansas & Eastern.—The profile map of the line through Booneville County, east of Franklin, Mo., filed with the county clerk last week, shows that the route between Rochefort and Cedar City follows the north bank of the Missouri River very closely, with only minor deviations at a few points. The line is under contract for this distance, the terminus of the work being at a point opposite Jefferson City.

Missouri, Kansas & Texas.—A committee of citizens has been engaged for some time in securing the right of way and terminal facilities in Houston, Tex., for an extension of this road from Boggy Tank east to Houston, 25 miles, which it expected to induce the company to build. The cost of the right of way into Houston has been found to be much in excess of the amount of subscriptions received by the committee and a new route will have to be surveyed. Whether the company will be willing to accept the new entrance is thought to be doubtful.

Nampa Railway & Construction Co.—The surveyors have about completed the preliminary line from South Mountain and Silver City in Southern Idaho to De Lamar and the Snake River. The engineers are now working on the section north of the river to Nampa near Boise City.

New Roads.—A meeting of the projectors of a proposed new road to run from Winslow Junction to Sea Isle City, N. J., will be held this week at the office of William Gorman, 533 Walnut street, Philadelphia. It is proposed to organize a new company to build a line parallel with the Philadelphia & Seashore road. The estimated cost is about \$400,000. The parties who are interested in the new proposed road are Morris Boney, Vice President of the Philadelphia & Seashore; George H. Becker, William Gorman and James Conway, of Philadelphia, and others.

C. M. Hawkins is arranging for the construction of a standard-gauge road from Littleton, N. C., to the Panacea Springs, a distance of three miles.

F. J. Moser, formerly Chief Engineer of the Morris-town & Cumberland Gap road, is reported to have recently completed a profile for a new Kentucky road east of Louisville, which will probably be built by Allison, Shafer & Co., of Louisville.

A company has been formed at Albany, N. Y., to build an inclined railroad two miles long, five-eighths of a mile having an ascent of 800 ft. The road is to connect a large summer resort with the Susquehanna Division of the D. & H. C. Co.'s railroad at Meadowdale, Albany County, N. Y., and will be operated for passengers and freight traffic. The Hon. James H. Manning, Mayor of the city of Albany has charge of the road, and Mr. Franklin H. Jones is the architect.

New York & Boston Island.—A charter for this company, whose directors are residents of Boston and Middletown, Conn., was filed in Connecticut last week. It was reported that \$455,000, or 20 per cent. of the capital stock, had been subscribed and that 10 per cent. of this had been paid in. The proposed route is from Thompson, in the northeastern part of the state, southeasterly through Middletown, a distance of 90 miles, to Milford on Long Island Sound, near New Haven, where it will connect with the New York, Bridgeport & Eastern. The latter is a reorganization of the old "Olmstead parallel." Failing to get a special charter, its organization has been kept alive under the general railroad law, with the design of some time in the future paralleling the New York, New Haven & Hartford, if the capital can be raised. At Thompson it is proposed to connect the new road with a line chartered in Massachusetts.

New York Connecting.—The company was incorporated at Albany, N. Y., last week. It is the purpose to build a steam railroad from a point in Westchester County, east of Bronx River, to Brooklyn, a distance of 10 miles, including a series of bridges across the East River.

New York, New Haven & Hartford.—The purchase by this company of a valuable piece of land in Williamantic, Conn., which is so situated that it is available as a site for a union passenger station, has started the report that the company will build a line into the city from Air Line Junction. It now uses the tracks of the New York & New England from that point.

Ohio River.—The extension of this line from Huntington, W. Va., the present terminus of the road, to Kenova, on the Kentucky state line, is being pushed rapidly forward. The grading is now completed to Ceredo, W. Va., and the bridge builders are at work on the bridges over Twelve Pole and Jordan Branch rivers. The line will follow the line of the Chesapeake & Ohio very closely and will almost parallel it.

Pennsylvania.—President Roberts talked at some length to a reporter last week of the improvements to be undertaken this year. During the year, he said, the company would spend about \$15,000,000 for new locomotives, new cars, both freight and passenger, and for the laying of additional tracks and sidings. He repeated what he had stated in January, that the largest amount will be spent for equipment. "We will have built 150 additional locomotives, which is considerably more than our yearly addition. Besides this we will have 225 new passenger coaches constructed, and, counting all lines east and

west of Pittsburgh, there will be 8,000 freight cars built. On the New York division, between Frankford and Wissinoming, we will elevate the track and put in three or four bridges, thus doing away with that many grade crossings. We intend to take out every grade crossing on our New York division. Another large expenditure will be the improvements at Trenton, extending the third track to Downingtown, and straightening and adding second and third tracks on the Harrisburg & Mt. Joy road. The work at Trenton will be completed by June 1, and at the same time we expect to have the station at Jersey City completed. The passenger room is now in use. In regard to the improvements in Philadelphia we cannot do much until the city begins on its harbor improvements. Delaware avenue ought to be widened from Market street south, and it could easily be finished within two years. Where Delaware avenue is widened we will tear down our ferry houses, and erect new ones. We will construct a bridge across Delaware avenue, so that there will be no danger in crossing to the ferry."

The second track on the Trenton Cut Off branch recently begun, is being built between Glen Loch and Bridgeport, Pa., on the west end, and between Morrisville and Loughome on the east end. Altogether 16 miles of second track is now under construction. The railroad company is doing the work with its own men, no contractors being employed.

Piedmont, Laney & Birmingham.—C. S. McDaniel, of Irondale, Ala., one of the directors of the road, states that he has perfected an arrangement with a New York syndicate for completing the road, and that the grading north of Laney, Ala., will be commenced in a few weeks. The line is partly graded between Laney and Piedmont, and it is expected to complete the 20 miles between these points this summer. The line extends to a through valuable mineral deposits in the eastern part of the State.

Portland & Rumford Falls.—The construction of the Rumford Falls extension is still proceeding along the Androscoggin River. The line will be opened for traffic on July 1.

Reading, Lancaster & Baltimore.—About 250 men began work last week on the road between Reading, Pa., and Adamstown, Lancaster County, 12 miles west. The line will be extended from the latter place south to New Holland and thence to the Maryland state line to the terminus at the head of Chesapeake Bay. Several routes have been surveyed for an entrance into Reading, but the terminals in that city have not yet been selected.

Sandusky & Columbus Short Line.—A force of men began the grading last week at Flat Rock, Seneca County, and will proceed southward. This is the first work to be begun south of Belleville, the end of the ballasted road.

Springfield, Sedalia, Marshall & Northern.—A meeting of the projectors of this company, of the Brookfield & Northern, and of the company which has taken out a charter in Iowa, was held in Brookfield, Mo. It is proposed to consolidate the three companies, but what effect this is going to have on the construction of the line seems obscure. The projectors have at least surveyed a line from Springfield, Mo., to the north state line of Missouri.

Texarkana & Fort Smith.—This road was completed into Milken, Ark., last week, and trains have begun running to that point, 33 miles north of Texarkana, and about five miles beyond the former terminus of the operated line. The line is under contract beyond Milken to Lockesburg and will probably be completed to that point during the summer.

Texas, Louisiana & Eastern.—President C. M. Putnam, who is now in Chicago, writes that he has placed \$150,000 of the bonds, and that he has arranged for the completion of the line to the Trinity River this summer. The work on the line will now be resumed and work pushed rapidly. The grading has been completed east from Conroe, Tex., for about 23 miles and the rails have been laid for over seven miles. The line will be completed to the connection with the Houston East & West Texas at Keno, Tex., by June, and the work will reach the Trinity River early in the fall.

Thomasville Silver Valley & Pee Dee.—The annual meeting will be held at Thomasville, N. C., May 5. Important business looking to the immediate construction of the road will be submitted. The road is projected from Winston and Thomasville, south to Wadesboro, N. C., about 90 miles. John T. Cramer, of Thomasville, is president.

Tomhicken, Milnesville & Eastern.—A charter was granted in Pennsylvania this week to this company. The road will be eight miles long from a point on the Sunbury, Hazleton & Wilkesbarre road, near Tomhicken, Luzerne County, to Milnesville, in the same county. The President is A. S. Van Wyckie, of Hazleton.

Tuskaloosa Northern.—The directors of the Tuskaloosa Coal, Iron & Land Co. have granted Captain F. M. Abbott 20 days' longer extension of time in which to begin work on this road. This extension will enable Captain Abbott to make all necessary arrangements, and he hopes to begin work early in May.

Watertown, Sioux City & Duluth.—The line has now been located from Watertown to a point near Hankinson, N. Dak., a distance of about 100 miles. The contracts will not be awarded and no further work will be undertaken until the right of way is assured through the Sisseton Reservation. The difficulty in this part of the work was explained last week. The maximum grade on the line just surveyed is one per cent. on one section of about two miles. About 30 miles of the road is nearly level, but on 10 miles there will be quite heavy work in cuts and fills. The maximum curvature will probably be four degrees, but profiles have not yet been made. George W. Carpenter is the Chief Engineer.

West Virginia Central & Pittsburgh.—The road is now running regular trains from Elkins, the former terminus of the road, to Belington and Beverly, W. Va., the termini of the two extensions built by the company last summer. Connection has not yet been made with the Grafton & Greenbrier road at Belington, though it will be as soon as the standard gauging of the latter is completed.

Yakima, Natchez & Eastern.—This company was organized at North Yakima, Wash., last week, by George Donald and G. M. McKinney. It is proposed to build a system of narrow gauge lines through the fertile valleys in the vicinity of North Yakima and east to the Columbia River, a distance of about 30 miles. The first line to be built is that west along the Natchez River toward the Cascade Mountains. The projectors propose to begin grading in May, and to complete the line up the Natchez Valley to Sunnyside before the next harvest.

Yankton, Norfolk & Southwestern.—The grading was commenced last week on this line south of Yankton, S. D., and about 100 men are at work. The road has secured subsidies from towns along the line sufficient to complete it to that point by next November.

Youngstown Belt.—A belt line to encircle Youngstown, O., is being advocated.

GENERAL RAILROAD NEWS.

Brooklyn & Brighton Beach.—The company will pay a March dividend, the first since September, 1890, when the company defaulted interest on its first-mortgage bonds. The payment of a dividend is said to have been the result of a well authenticated report that Austin Corbin was endeavoring to secure control of the road, and was purchasing bonds with a view to foreclosing a mortgage of \$500,000, thus gaining control of the road. It is reported that the stockholders subscribed a large sum of money with which to liquidate the road's most pressing liabilities.

Delaware & Hudson Canal Co.—The annual meeting of the company will be held May 10, and it is expected that a change will be made in the directory to permit of the election of representatives of the Vanderbilt interests, which is known to have acquired a considerable amount of the company's stock. The present management of the company has proxies of a large majority of the stock. The officials of the New York Central state that conferences have been held with the Delaware & Hudson directors looking to the representation of Vanderbilt interest in the new board.

Duluth, Red Wing & Southern.—The road is to be sold at Red Wing, Minn., June 7, on a judgment for \$28,000 obtained by W. H. H. Spafford, of New York. The line was built in 1890, and is now in operation from Red Wing, on the Mississippi River southwest to Rochester, Minn., 51 miles.

Grand Rapids, Lansing & Northern.—In the Circuit Court at Grand Rapids, Mich., April 21, an order was made granting the motion of McRae & Lally, contractors, for the appointment of a receiver for the road. The contractors hold a judgment for \$91,000 against the railroad for construction work and material supplied. The road extends from Grand Rapids to Grand Ledge, Mich., 53 miles, and all the capital stock is owned by the Detroit, Lansing & Northern, which operates the road under lease.

Kansas City, Fort Smith & Southern.—The stockholders of the company at a meeting at Kansas City this week voted to increase the capital stock of the company from \$800,000 to \$2,000,000. It was also decided to extend the road this year 50 miles beyond its present southern terminus.

Kinzua Valley.—The control of this road was acquired by the Western New York & Pennsylvania last week and it will hereafter be operated by that company. The line is about ten miles long and runs up the Kinzua Valley, reaching valuable timber tracks in McKean County, Penn.

New York, New Haven & Hartford.—The lease of the New York, Providence & Boston Railroad to this company is to be submitted for approval to the stockholders of the former company, at Providence, on May 25, and to those of the lessee company, at New Haven, on May 29. The lease is for 60 years from April 1, 1892, at a rental of 2½ per cent. per quarter on the stock until 90 days after the New Haven road has offered its own stock in exchange for it, share for share. Thereafter the rental is to be 6 per cent. per annum.

North Pacific Coast.—William Graves, an Eastern capitalist, has been negotiating for several months to secure control of this railroad, which is now owned by J. W. Coleman and William Steele, of Oakland, Cal. A press dispatch printed this week states that the negotiations have been completed and that the transfer will be made immediately. The road is narrow gauge and about 90 miles long, extending from Sausalito, Cal., north to Cazadero. The present funded debt of the road is \$1,200,000, but this is to be refunded and a new mortgage issued for \$1,500,000. The fixed charges, about \$77,000, are a little in excess of the net income and there is a floating debt of \$250,000.

Oregon & Washington Territory.—The property of this road was sold at Portland, Or., last week by the Master in Chancery to C. B. Wright, of Philadelphia, for \$1,250,000. The sale was to satisfy a decree of the United States Court in favor of the Farmers' Loan & Trust Co., of New York. The control of the road, which extends through the wheat growing country in Eastern Washington, and has a mileage of about 165 miles, was purchased from G. W. Hunt some months ago, and the lines have since been operated by Mr. Wright.

Philadelphia & Reading.—The statement of earnings and expenses of the railroad and the Coal and Iron companies for the month of March shows an increase of \$304,526, and for the fiscal year to date, an increase of \$804,641. The statement of the railroad company as compared with the same month last year is as follows:

Month of March:	1892.	1891.	Inc. or dec.
Gross receipts.....	\$1,820,503	\$1,551,400	I. \$269,103
Gross expenses.....	1,065,790	938,034	I. 127,756
Profit in operating.....	\$754,713	\$613,366	I. \$141,347
Other receipts.....	12,097	16,199	D. 4,102
Profit for month.....	\$766,810	\$629,565	I. \$137,245
Exp. for perm. improv.....	\$5,715	\$41,110	D. \$35,395
One-twelfth fixed charges..	250,000	611,760	I. 15,230
Total.....	\$633,715	Def. \$553,179	D. \$119,464
Surplus.....	\$113,784	Def. \$43,614	I. \$157,398

Four Months Dec. 1, March 31.

Gross receipts.....	\$7,218,101	\$6,420,517	I. \$797,585
Gross expenses.....	4,070,100	3,817,034	I. 253,066
Profit in operating.....	\$3,148,003	\$2,603,483	I. \$544,519
Other receipts.....	190,160	155,531	I. 34,629
Profit for month.....	\$3,338,163	\$2,759,015	I. \$579,148
Expn. for perm. imp.....	\$72,438	\$183,673	D. \$111,235
One-twelfth fixed charges..	2,500,000	2,447,077	I. 52,922
Total.....	\$4,572,438	\$2,680,756	D. \$1,891,682
Surplus.....	\$735,725	\$128,250	I. \$607,475

St. Louis, Iron Mountain & Southern.—A special meeting of stockholders has been called to meet at St. Louis May 27, for the purpose of acting upon the proposed purchase of the Camden & Alexandria. This road is in operation from Camden, Ark., to Eldorado, Ark., a distance of 32 miles, and projected from the latter point

to a connection with the Houston, Central Arkansas & Northern.

Union Pacific.—The annual meeting in Boston on Wednesday resulted in the re-election of the present management, the proxies secured by the Gould interest exceeding by about 10,000 shares those held by the interest opposed to the re-election of the Missouri Pacific officers. The statement of earnings for the entire system for the last fiscal year ending Dec. 31, 1891, as given out at the meeting, was as follows:

	1891.	1890.	Inc. or dec.
Gross earnings.....	\$44,065,730	\$44,538,291	D. \$472,561
Op. expen.....	30,261,000	32,199,135	D. 1,938,135
Net earnings.....	\$13,745,730	\$12,339,086	I. \$1,406,644
Other income.....	1,594,324	1,061,784	I. 532,540
Total income.....	\$15,340,054	\$13,400,870	I. \$1,939,184
Interest.....	10,191,682	9,674,486	I. 517,196
Balance.....	\$5,148,372	\$3,726,384	I. \$1,421,988
Other charges.....	4,083,332	4,091,390	D. 8,058
Surplus.....	\$1,065,040	I. \$1,340,076
Deficiency.....	\$275,036

The surplus is equal to 1.74 per cent. on the stock. The other charges are \$1,067,900 for sinking funds, \$1,293,230 to the United States, discount, etc., \$891,500, and Oregon Navigation Co.'s deficit, \$672,581. The charges to new construction and equipment were \$1,235,989, against \$8,288,541 in 1890. Of the \$24,000,000 collateral trust notes \$18,530,000 have been issued at 92½. The gross earnings were \$5,568 per mile, against \$5,692 the previous year, and net \$1,768, against \$1,618. The rate per ton per mile was 1.343 cents, against 1.382 cents in 1890. Passenger earnings decreased \$852,348, or 9.1 per cent. The funded debt in the hands of the public is \$227,528,422, against \$210,412,480. The debt per mile of the system is \$28,278. The net floating debt of the Oregon Short Line system increased in the year \$883,700. The Oregon Short Line & Utah Northern system had a deficit of \$408,107, against \$1,306,682 in 1890. The loss on Oregon Navigation was \$1,126,948, against \$1,780,190 in 1890. Union Pacific, Denver & Gulf, including Fort Worth & Denver City, had a surplus of \$37,884, against \$104,776 in 1890. The Union Pacific Co. has due it \$4,727,889, and the Kansas Pacific \$4,072,396, from land sales. Massachusetts holds 24½ per cent. of the stock. Foreign countries have 174 stockholders who own \$214,818 shares, against 199,836 shares at the close of 1890.

Valley (Ohio).—The annual report shows the earnings and expenses of the company for the fiscal year ending Dec. 31, 1891, as follows: 1891, gross earnings, \$757,440; 1890, \$779,433; operating expenses, 1891, \$541,435; 1890, \$516,831. The gross earnings show a decrease of \$21,993, and the expenses an increase of \$24,604. The road is controlled by the Baltimore & Ohio, and is 75 miles long, extending from Cleveland to Valley Junction.

Virginia & Carolina.—This road was sold at Richmond, Va., April 27, at foreclosure, for \$75,000. The city of Petersburg, which holds \$100,000 in first mortgage bonds of the company, with about \$20,000 of accrued interest, was the purchaser. The road was organized about 10 years ago, and was projected to extend from Warren Junction, on the Raleigh & Gaston, to Richmond, a distance of about 100 miles. The city of Petersburg subscribed \$100,000 toward the enterprise, accepting first mortgage bonds therefor. Other parties put in about \$200,000 more. The roadbed from Petersburg south was graded for about 40 miles, but no rails were laid. The property was sold in August, 1888, and the company reorganized, but no work was done under the new officers.

Western New York & Pennsylvania.—The trouble between the company and the Lake Shore & Michigan Southern, concerning the use of the latter's track by the former, between Oil City and Stoneboro, Pa., has been amicably settled, and on May 1 the Western New York & Pennsylvania will resume running trains over that branch.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 27, 1892.
The Western lines, failing to obtain any encouragement that the "Soo" line would withdraw its 55 cent rate on compressed wool from St. Paul and Minneapolis to Boston, have entered into a pro-rating arrangement with the Chicago & Grand Trunk, under which Chairman Midgley, on April 20, authorized members to join the Chicago & Grand Trunk in meeting the rates of the "Soo." The through tariff via St. Paul and the Soo line from Utah common points to Boston is \$2.22 per 100 lbs. In order to meet this, a reduction of 28½ cents per 100 lbs. was authorized via Mississippi River crossings, Dubuque and south thereof, in connection with the Chicago & Grand Trunk via Toronto and Montreal, making the rate the same via Chicago as via St. Paul. On April 23 Chairman Midgley issued a tariff on sacked wool from Montana common points to Boston, reducing the rate to 75 cents per 100 lbs., carloads, from St. Paul to Boston, via Chicago and the Grand Trunk line, to go into effect May 2. This will probably turn most of this wool via Chicago. The other Eastern lines are regretting that they refused to join the Western roads in the proposed reductions. After the Chicago & Grand Trunk had made the arrangement, they discovered that they were likely to lose all the wool for the season, and overtures were then made to Mr. Midgley, looking toward their participation in the arrangement, but as yet he has not authorized the routing of this business by any line but the Grand Trunk.

The usual rumors of cuts in lake and rail rates are current, but as yet they have but little foundation. The report last week that the Fitchburg in connection with the Clover Leaf line had made a reduction in westbound rates to East St. Louis grew out of the issuing of a tariff by the Fitchburg, containing erroneous rates, which were corrected by a subsequent issue. The only reduction thus far announced is by the Lehigh Valley Transportation Company, April 18, reducing fifth class rates, Chicago to New York, from 22½ cents to 20 cents per 100 lbs., with usual differentials to other seaboard points.

Western Passenger Association lines have been authorized to use the reduced rates to Ohio River points as basing rates from lower Missouri River points and Omaha, and the Rock Island has given notice that it proposes to apply them from St. Paul and intermediate territory.

Indications point to a general scramble for the passenger business to Denver during the convulse of the Knights Templar next August, and it will require considerable exertion on the part of the associations to keep the lines in check and prevent a demoralization of rates at that time.

The Commissioners of the Western Traffic Association have declined to grant an application to establish a rate of 7 cts. per 100 lbs. on lumber from Rock Island and Moline to Chicago. The application contemplated a reduction of 3 cts. per 100 lbs. in order to move certain culled lumber. The Commissioners state that they are of opinion that the reduction could not be made without seriously complicating the general situation in respect to lumber rates. An application for a reduced rate on ice from St. Paul to St. Louis was also denied, as it would tend to reduce rates at points where no objection to the present rates exists. A proposition to materially reduce rates to Colorado and Utah, common points from Chicago, Mississippi River and Missouri River points has also been decided in the negative. The Commissioners in their decision state that no suggestion is made that the present rates are not reasonable, the appeal being presented simply as a method proposed for the correction of the present distribution of the traffic in question, which is alleged to be unfair. They are without evidence which would warrant them in authorizing the reduction.

Lake rates are firmer and grain rates are 1½ cents a bushel for corn and 1¼ cents for wheat to Buffalo. Vesselmen are reported as holding off at these figures, looking for a 2-cent rate on corn. The fluctuations this week are likely to be confined between 1½ and 2 cents, depending to a large extent upon the tonnage available.

It is said that, beginning with June 1, the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern and the Chicago, St. Paul, Minneapolis & Omaha will abolish the use of stop-overs on their lines and limit tickets to continuous passage, and that similar action will be taken by the Burlington July 1. It will be remembered that the Chicago & Alton led in the adoption of this reform at the beginning of the year.

Interstate Commission.

The Commission, in an opinion by Commissioner Veazey, has announced its decision in the case of E. M. Raworth against the Northern Pacific, the Union Pacific and others, in favor of the complainant. The case involves the question of greater rates on sugar in carloads from San Francisco to Fargo than for the longer distance over the same line to St. Paul. The Commission holds: Carriers alleging justification of a departure from the "long and short haul" rule must in their answers clearly advise complainants of the facts and circumstances relied on as constituting such justification. There is no competition by rail over the Canadian Pacific or by water around Cape Horn that justifies a departure from the long and short haul rule in the transportation of refined sugar from San Francisco to Fargo and through Fargo to St. Paul.

The "long and short haul" rule of the statute was intended to maintain and promote and not to destroy or neutralize natural commercial advantages resulting from location. Competition at St. Paul with sugar from the East refined in New York, although necessitating the prevailing low rates to St. Paul on sugar from the West refined at San Francisco, does not justify the greater charge on the latter to Fargo.

Section 2 of the "act to regulate commerce," forbidding unjust discrimination, applies even in cases where a departure from the long and short haul rule is shown to be authorized, and the rule, if established, of making the greater charge for the shorter haul does not justify a disparity in rates so great as to result in unjust discrimination. The facts that the rates to longer distances cannot be raised without a loss of the traffic involved, and that the rates to both the long distance point and the short distance point are not unreasonable in themselves, do not justify a disparity in such rates resulting in unjust discrimination as against the shorter distance point.

The Northern Pacific is not exempt under its charter from the authority to regulate rates conferred on the commission by the act to regulate commerce.

Traffic Notes.

Considerable shipments of flour are being made at St. Louis for Havana, Cuba.

Dodd's Express is to be superseded, on the lines of the Philadelphia & Reading system, on May 1, by Westcott's express.

The shipments of cattle by railroad from Southern Texas to the grazing grounds in Indian Territory and other Northern regions, are much heavier this season than in any previous year.

Canadian Pacific officers report that 6,000 settlers have already passed through Winnipeg this year, double the number up to this time last year. Eighty thousand acres have been sold, as against 16,000 in 1891.

A Cincinnati paper states that 16 carloads of pianos arrived in that city in one shipment over the Cincinnati, Hamilton & Dayton, from New York, lately. It is not stated whether or not the cars were fully loaded.

The Philadelphia & Reading has stirred up the grain dealers of Philadelphia by announcing that carload freight from the West will not be recognized in transit unless the bills of lading are deposited before the arrival of the cars.

A Cleveland paper reports a slight improvement in lake rates, but boats have not as yet been able to get offers of more than three cents a bushel on wheat from Duluth to Buffalo. The rate on ore from Escanaba to Ohio ports is 65 cents a ton. Vessels are still prevented by the ice from reaching Duluth.

At Topeka, Kan., this week, the United States Grand Jury returned indictments against the following officers of the Union Pacific for violations of the Interstate Commerce law: C. S. Mellen, ex General Traffic Manager; J. A. Monroe, General Freight Agent; J. G. Woodworth, Assistant General Freight Agent, and the Local Agent at Salina. The cases were brought, it is said, on complaints of jobbers of Salina, Hutchinson, Arkansas City and Wichita.

The Southern Pacific promises the fruit dealers that the time of the fast freight train for green fruit will be reduced this year to about 40 hours from San Francisco to Ogden. The rate for shipments on this train will be on the basis of \$1.50 per 100 lbs. to New York. The Northern Pacific has agreed to make an important reduction in rates to enable fruit growers in the State of Washington to make shipments to points much farther away than has been possible heretofore.

Eastbound Freight Shipments.

The shipments of eastbound freight from Chicago by all the roads for the week ending April 26 amounted to 65,054 tons, against 80,062 for the preceding week, a decrease of 15,008 tons, and against 54,433 tons during the corresponding week of 1891, an increase of 10,621 tons. The Michigan Central headed the list, carrying 10,249 tons, while Lake Shore was second with 8,645 tons.

GEO. WESTINGHOUSE, JR.,
President.T. W. WELSH,
Supt.JOHN CALDWELL,
Treasurer.W. W. CARD,
Secretary.H. H. WESTINGHOUSE,
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THE WESTINGHOUSE AIR BRAKE COMPANY

PITTSBURGH, PA., U. S. A.

MANUFACTURERS OF THE

WESTINGHOUSE AUTOMATIC BRAKE

The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 292,000 cars. This includes (with plain brakes) 200,000 freight cars, which is about 20 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording an opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 140,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception.

Year.	No. per year.		Grand total.
1881	105		105
1882	1,085		1,190
1883	4,966		6,156
1884	15,051		21,207
1885	10,410		31,617
1886	8,946		40,563
1887	9,281		49,844
1888	27,696		77,540
1889	26,065		103,605
1890	50,502		154,107
1891	39,061		193,168

193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

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JOHN B. GRAY, Agent.

C. C. HIGHAM, General Supt.

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NEW YORK OFFICE,
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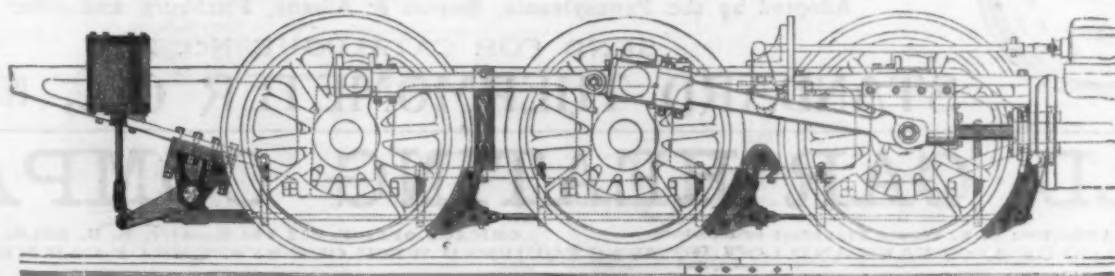
THE WESTINGHOUSE AIR BRAKE CO., Lessee,

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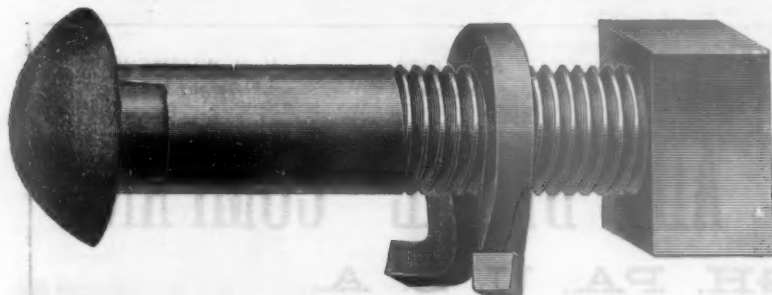
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Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers, furnished to operate with either STEAM, AIR or VACUUM.

THE "STANDARD" NUT LOCK



Manufactured under D. O. Ward's Patents by the
STANDARD NUT LOCK CO.,
 NOS. 236-248 BANK ST., NEWARK, N. J.
 SAMPLES FREE.

This nut lock is presented on its merits as the best and choicest device for securing track joints.

It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously; rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down thread of bolt.

The nut lock for $\frac{1}{4}$ bolt made of $\frac{1}{4}$ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, i. e., the curved shoulders or ends of the loop proper are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in inwardly curved extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.

Cannot get one end into elongated slot of angle-bar.

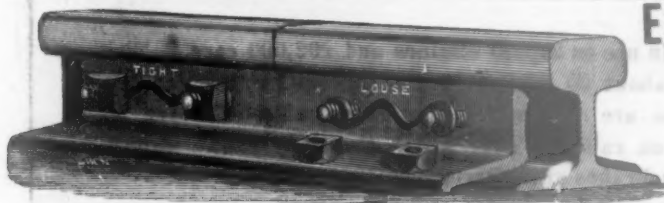
Unlike any permanently placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their dead "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.



Excelsior Automatic Nut-Lock and Fish Plate Spring

These Nut Locks have been adopted by the New England Road-Masters, in Conventions held at Hartford, Conn., Oct. 19 and 20, 1887, and Boston, Mass., Aug. 15 and 16, 1888, as the best Nut Locks known.

Sample lots furnished for trial, free of expense, by forwarding the distance between centres of fish-plate bolts. Correspondence and orders solicited.

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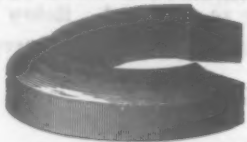


Simple.
Easily
Applied.
Very
Effective.

THE NATIONAL LOCK WASHER

THE ONLY POSITIVE NUT LOCK IN COMBINATION WITH ELASTICITY.

Sixty Millions in Use in
 Railroad Track



For Use on All Kinds and
 Classes of Work.

THE NATIONAL LOCK WASHER CO., Newark, N. J.

Made for all
 sizes of bolts.

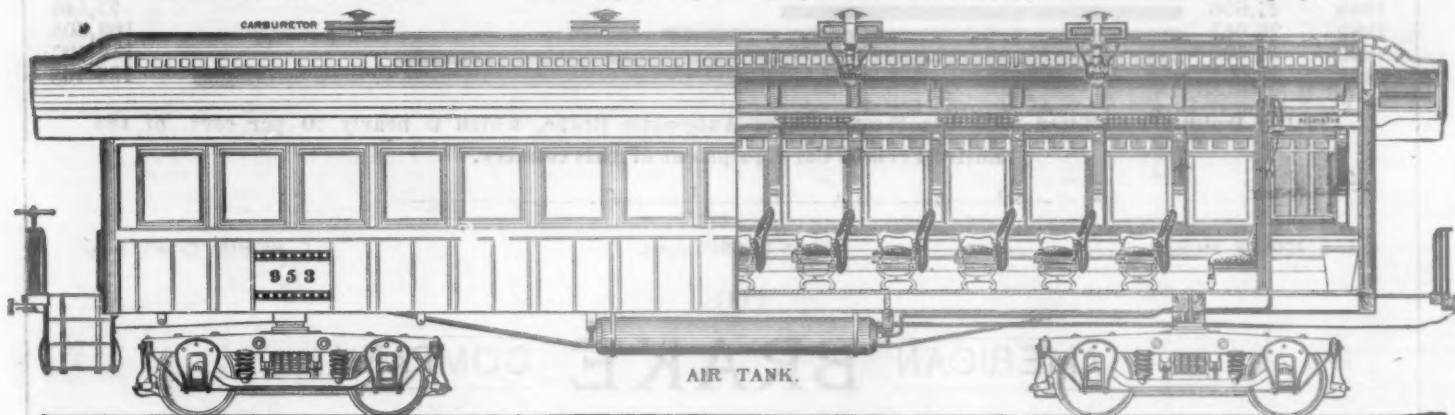
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Samples free of
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The Greatest Light of the Age.

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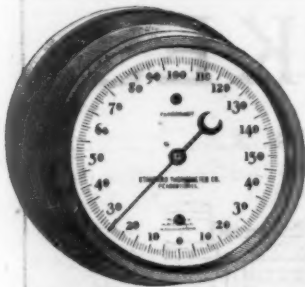


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It cannot fail to attract the attention of practical railroad managers on account of its absolute safety, durability, simplicity, efficiency and its great economy. Each lamp gives 100 candle-power illumination. One hundred hours' continuous service from one charging of the carburetor.

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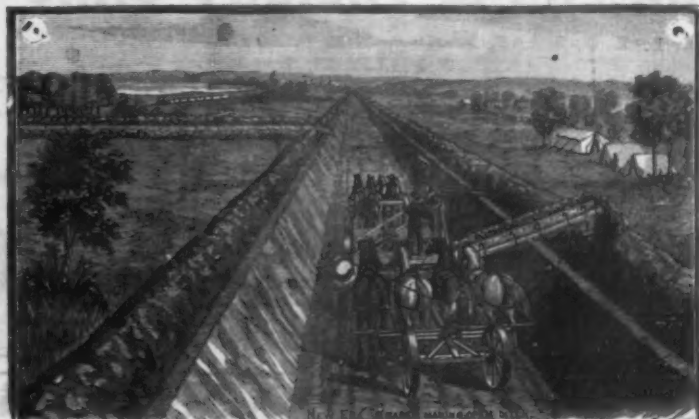
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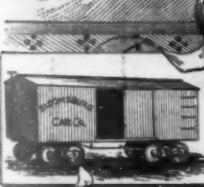
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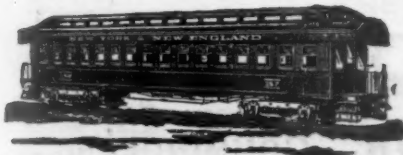
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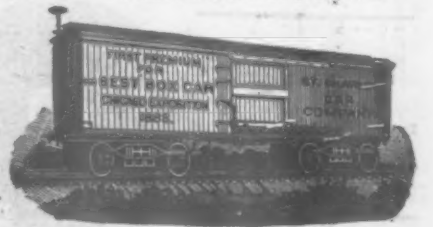
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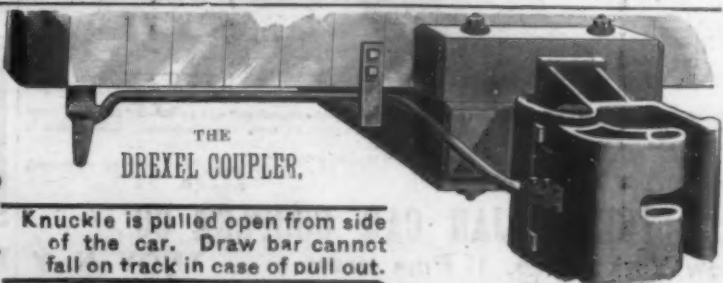
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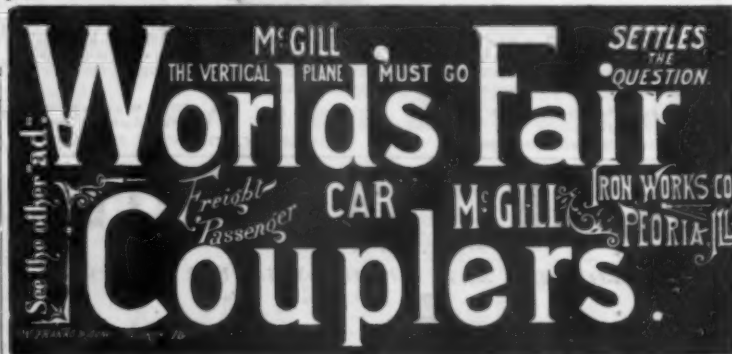
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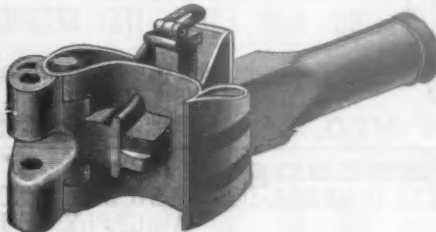
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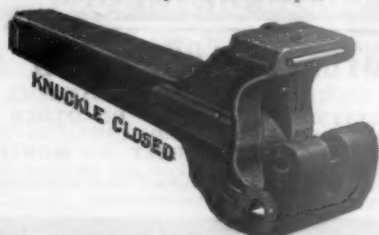
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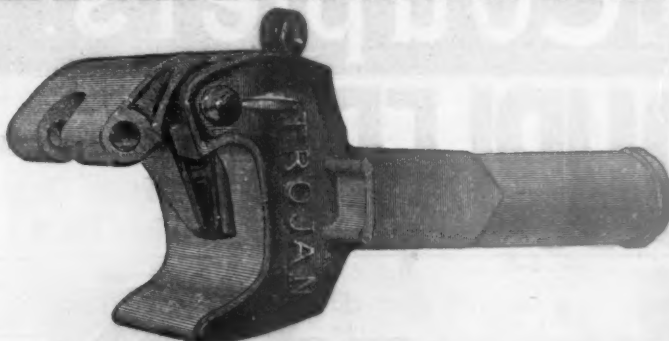
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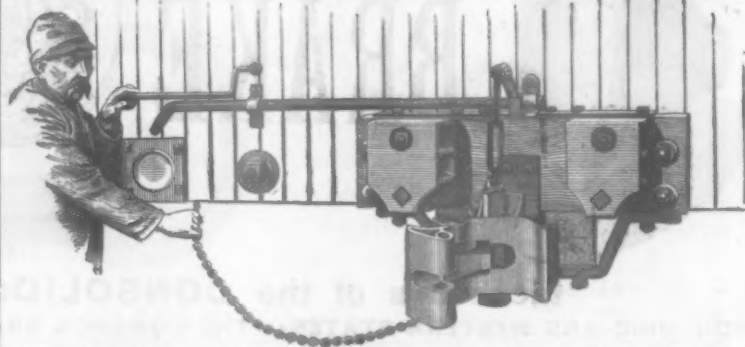
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With Chain Attachment for Opening the Knuckle WHEN REQUIRED.

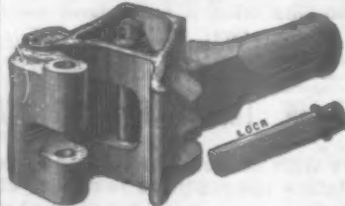
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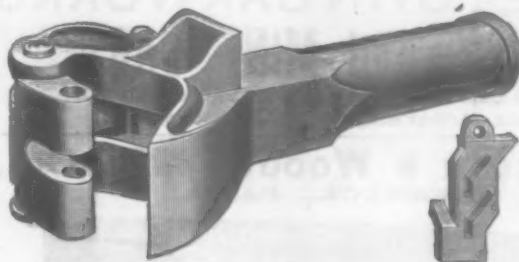
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Simplest,
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TENSILE STRENGTH (Fairbank's Test) 139,640. DROP TEST, 700 lbs. hammer dropped 18 ft. 22 times failed to break the knuckle.

Direct drop of full sized pin makes a double lock formed by draw bar at "C" and Pin "D." Equally strong if pivot pin "A" is lost. Should pin be lost, use any link—no chains being required. The strongest Knuckle and Coupler known. Cannot be unlocked by any jolt of the cars. Couples with all M. C. B. types. The locking pin drops behind the step on rear of Knuckle "K," and keeps the knuckle always open when cars are separated. Removing the pivot pins, 38 loaded gondola cars were drawn from Paterson, N. J., to West End (13 miles), the pull being entirely on the DOUBLE LOCK.

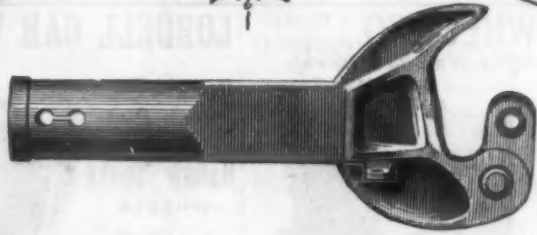
The drawbar is Malleable Iron. The Knuckle Pivot and Locking Pins steel.

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LIGHTEST COUPLER IN THE MARKET.

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KNUCKLE OPENS AUTOMATICALLY.

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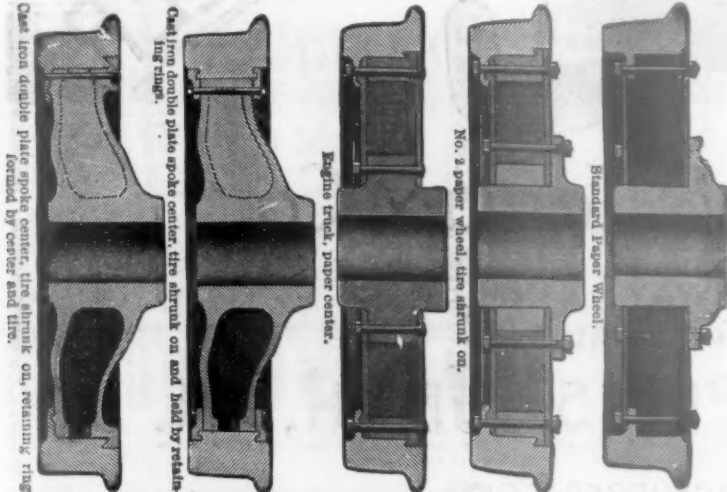
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CHILLED WHEELS OF ALL PATTERNS AND SIZES FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.
CAPACITY, 400 WHEELS PER DAY.

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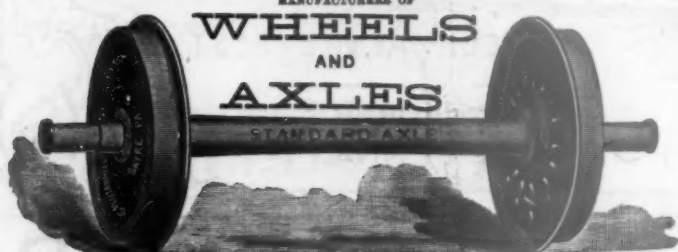
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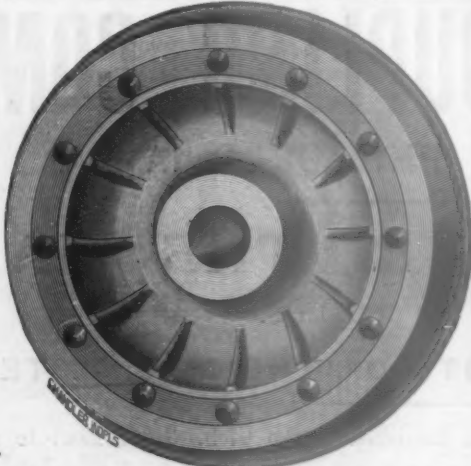


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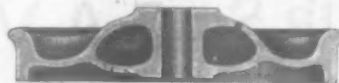
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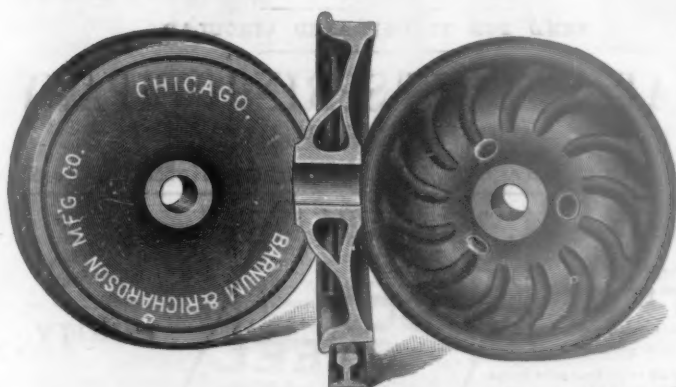
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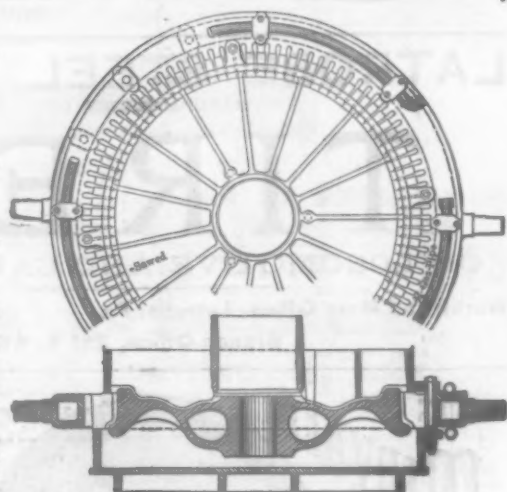
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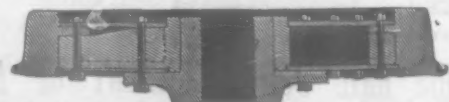
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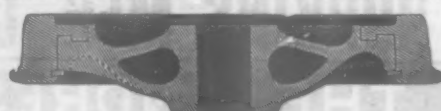
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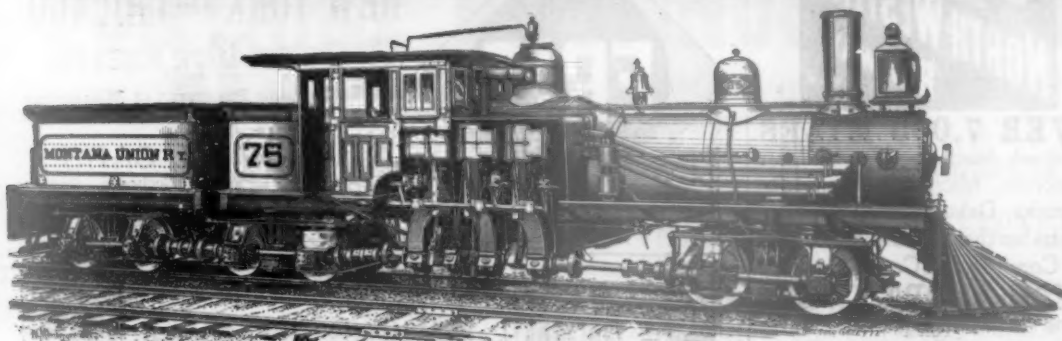
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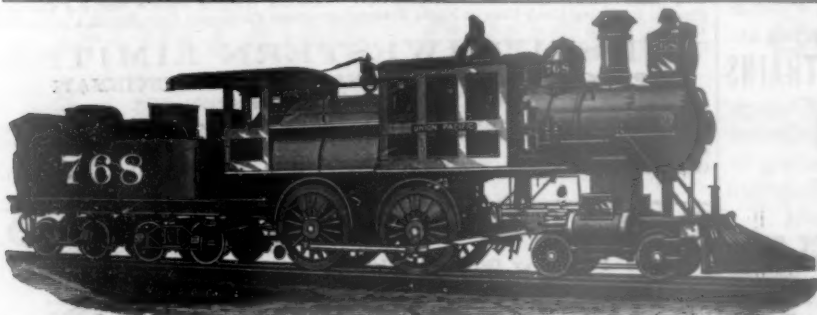
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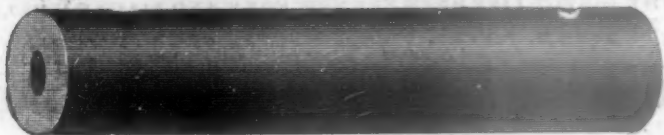
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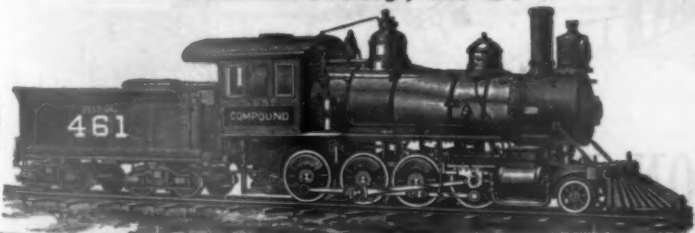
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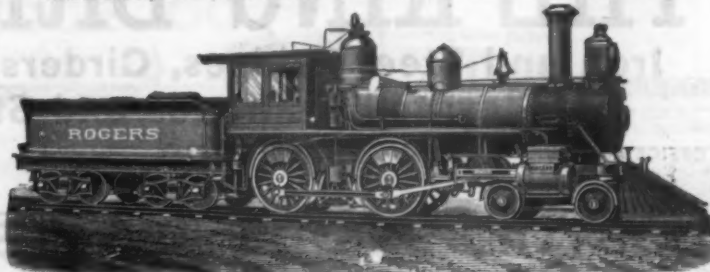
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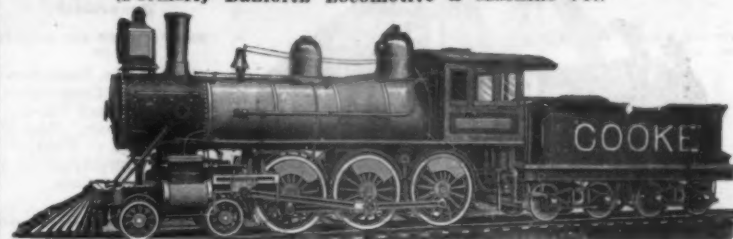
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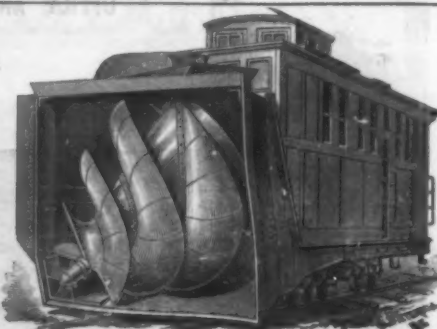
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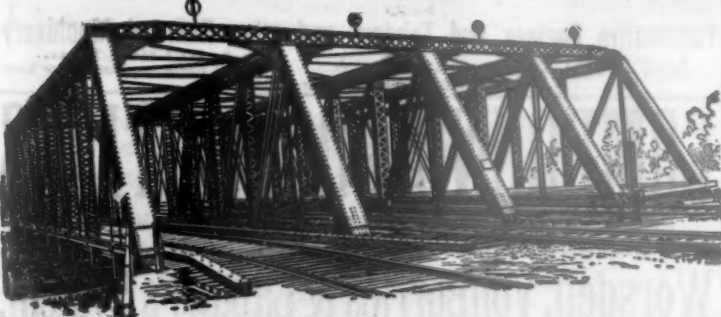
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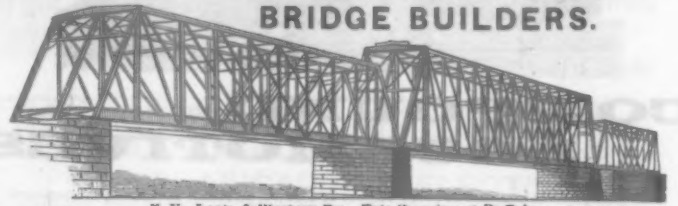
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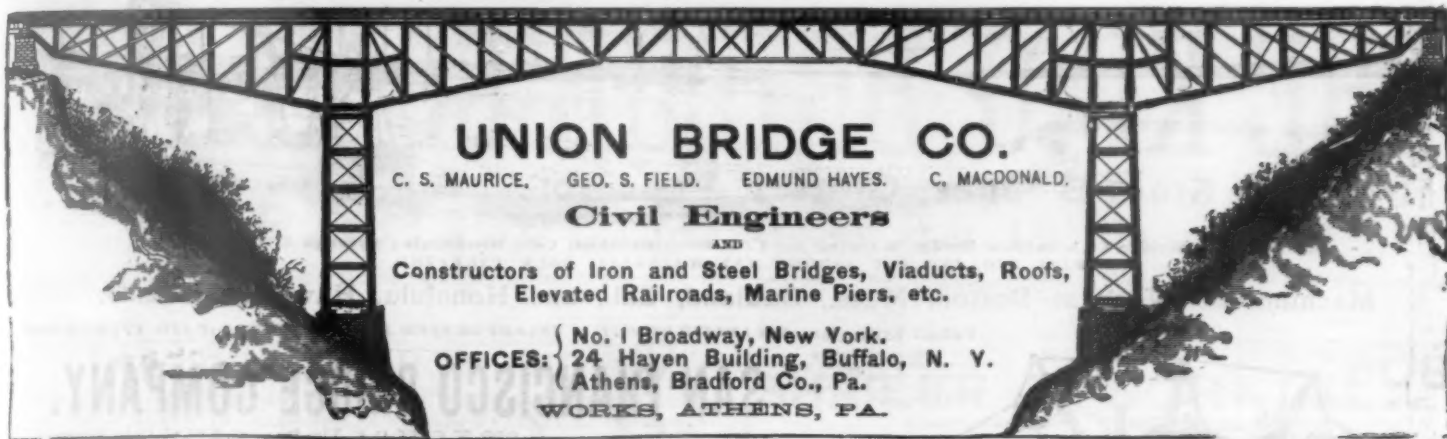
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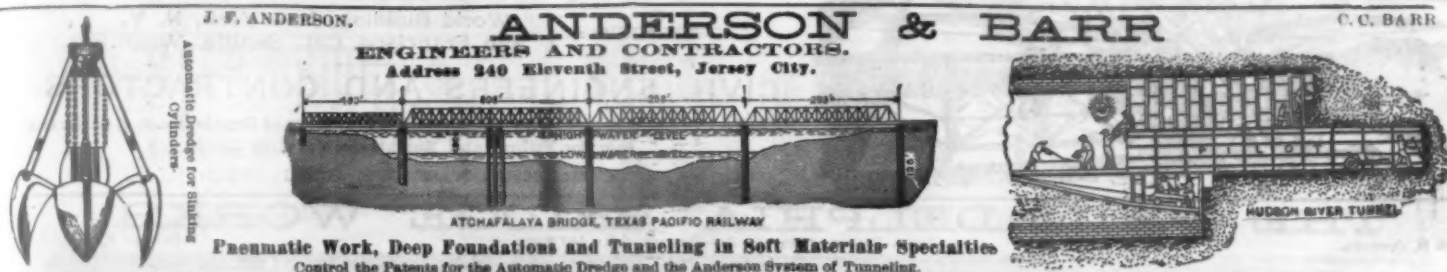
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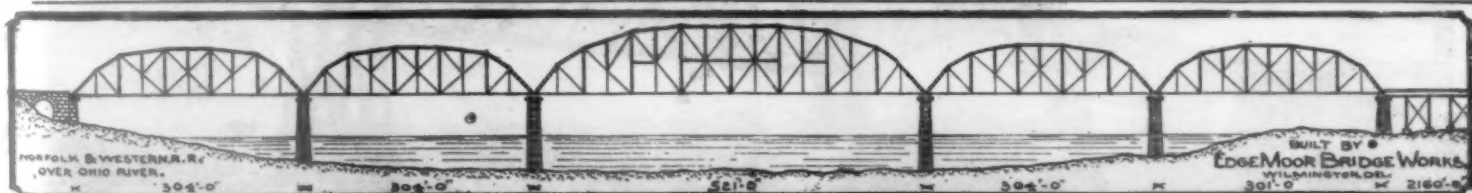
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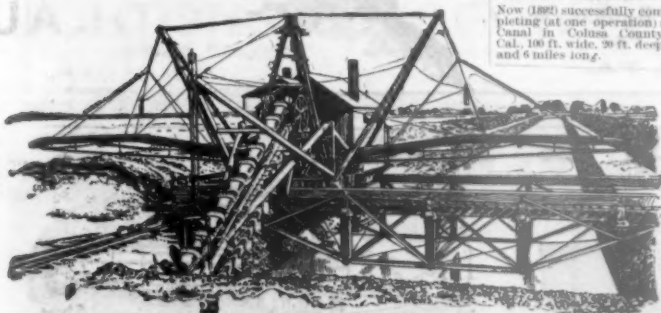
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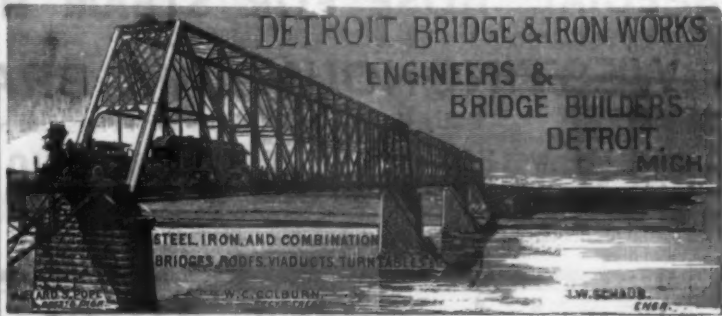
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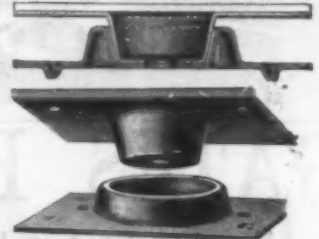
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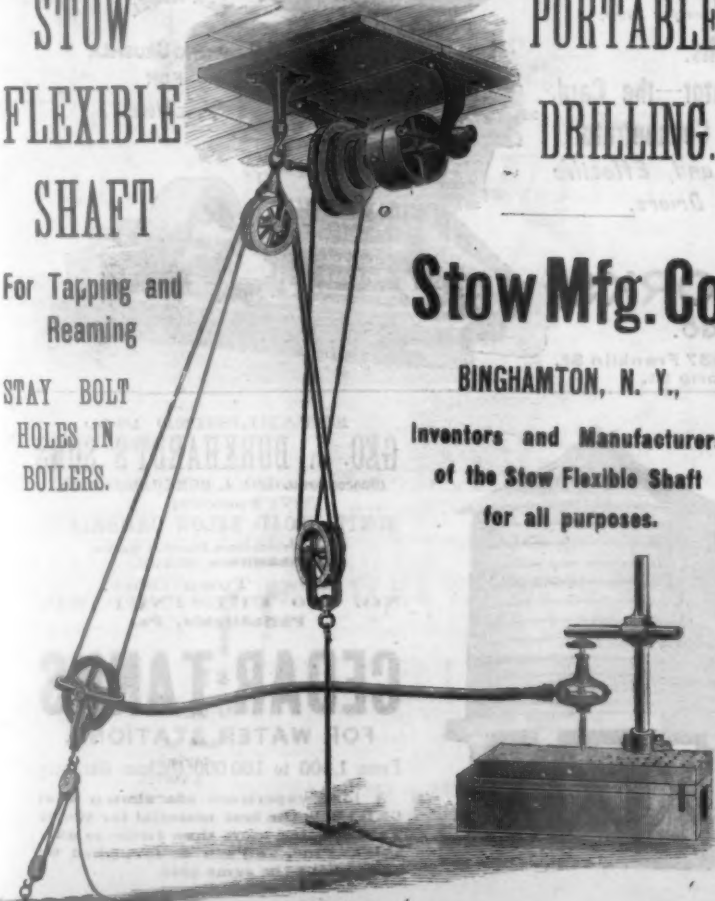
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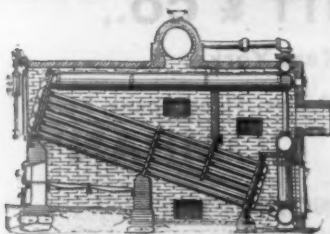
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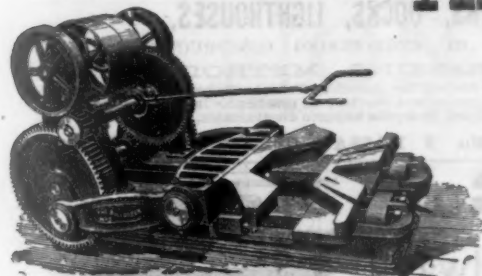
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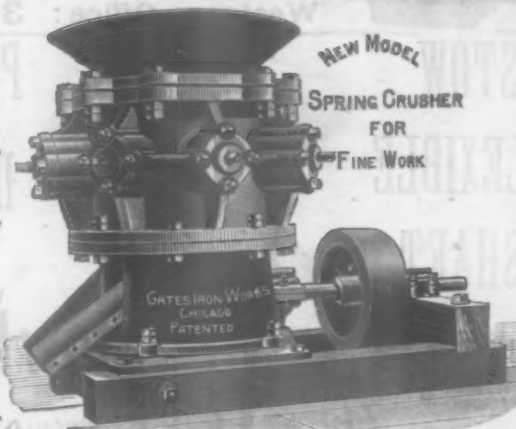


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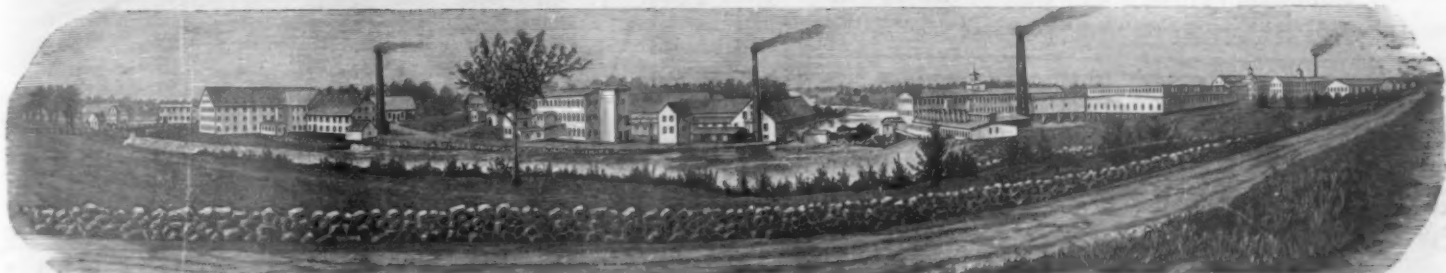
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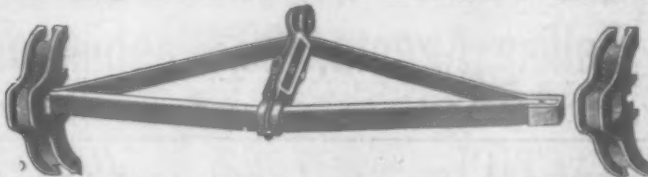
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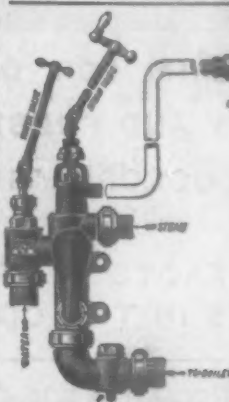
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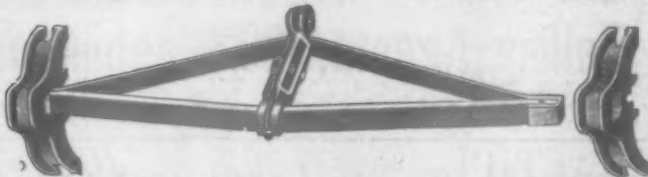
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